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The Power Press

in Mass Production Work

By E. V. Crane
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A NEW industry, that of the automobile, which has grown, practically in twenty years, to give employment to three million workers, whose ultimate product sold in 1926 for well over six billion dollars, has furnished momentum to the constant advance in prosperity as no old industry or combination could have done. Aside from direct employment, observe the debt to it of the gasoline producers selling eighty per cent of their product to motorists, of railroads carrying three million carloads a year of automotive freight, and of road builders and contributory industries. Tracing it on down to filling stations that cater to the motoring public at every turn, it all reduces to a statement tying the present prosperity with the rise of the automobile industry.

Economically the contribution is based, not upon size but upon rate of growth, capital expansion. According to a recent writer, "the present prosperity cannot be sustained unless some other industry, or combination of industries, develops as rapidly in the near future as the automobile has developed in the recent past." But industries have caught the contagion of mass production. This age of machinery continues to climb on the shoulders of

Fig. 1—Intensive press production of automobile parts

The battery of presses shown in Fig. 2 is engaged in the continuous production of small automobile and electrical parts at the rate of 5,000 per hour. Wherever possible in many industries parts are designed to be made from sheet metal in order to secure rapid production. The large, heavy-duty press shown in Fig. 3 is producing automobile fenders at the rate of one in 10 seconds

increasingly immerse ideas of initial investment. Among the latest developments are a host of electrical appliances, metal furniture, a new class of heating equipment, metal building trim, and automatic refrigeration. All of these have one thing in common with the automobile, which makes possible their production at a figure which will gain them access to the wide markets they require.

That which works these wonders is a class of machinery, metal working machinery, as opposed to metal cutting machcinery such as lathes, planers and drilling equipment. Power presses play the largest part, though rolling machines and special machines of various sorts contribute. As a class they have been developing gradually over most of a century, but they have not yet received their due.

The power press may be a small affair, blanking a razor blade or a watch part, every fifth of a second; or it may be a cumbersome machine forming the top of a metal casket every quarter of a minute. It plays an enormous part in production. A few years ago it was wondered whether industry had not reached its saturation point with respect to power presses, for such machines wear out very slowly, but the situation is now quite the contrary. Automobile manufacturers alone continue to absorb several million dollars worth of new equipment annually.

Mass Production Responsible

Wage payment systems, material handling methods, improved arrangement of facilities, all contribute to increased output per man-hour in the automotive industry. But their contribution amounted to little more than was reflected also in the steel, shoe, and paper industries, where these methods have been widely adopted. An increase to 300 per cent labor efficiency in ten years, however, could only be accounted for by the wholesale application of press-production methods, and that is what has happened. A curve showing the increase in use of power-presses in the automobile industry would follow closely the rise of the man-hour productivity curve. There was a drop in closed car prices when the closed body was put on a production basis, for it was then possible to have the all steel body, all press-produced. But it is not a case of the body alone, for nearly every metal part except the shafting, pistons, and engine block, is produced wholly or in part in presses or in related special machines, although the time was not so very far back when there was hardly a press-produced part on an automobile.

A few illustrations may be of interest. The long side-rails and the cross-members which make up the framework of the chassis are blanked or cut out from rolled steel sheets and then formed into shape in presses at the rate of two or three pieces per minute for each of the two operations, or faster for the smaller pieces. The rivet holes may then be punched, and the rivets holding the frame together may be closed in other smaller presses. Connecting rods are usually drop forgings which are trimmed in presses. Now the bosses at either end, instead of being machined to size, are squeezed between smooth surfaced dies in 600 or 800-ton coining presses at the rate of 20 or 30 per min. The variation in the finished pieces is less than 0.002 in. and this is less than the tolerance which was formerly allowed in machining them. Other forgings are also press sized and increasing numbers of both steel and brass forgings are being made in presses. In one method of making valve heads, for example, a slug is sheared from the end of a round bar; it is heated and squeezed into a ball and then into a valve, and finally trimmed ready to weld on the stem. The

Fig. 4—Punching disk wheels

four press operations, shearing, squeezing, resqueezing and trimming, require a total time of about 3 sec. Bronze wrist pin bushings made from strip material have the oil grooves stamped, and are blanked out at the rate of 50 a min. Then in another press, automatically fed, they are shaped into cylindrical form at the same speed. A final operation in a coining press insures perfect roundness, and the bushings are ready to use.

Small press operations, hand fed, cost only a tenth to two tenths of a cent each, including all overhead charges. For very large, slow work, requiring two or three men and a large machine the cost may run as high as 3c. but that is rare. In a closed car body with clinched seams there is hardly an operation on all the metal work between rolling the sheets and applying the paint and trimming, that is not done in presses. The secret of economy and of labor efficiency in press production is quantity. It is not worth while to make dies for a few parts, but when the quantity is a hundred thousand or a million, a thousand dollar die costs very little per piece, although that would be rated an expensive die. And at two to fifty thousand operations per day, every day, the investment charges on a press are almost negligible.

Press and die equipment is not inexpensive, however, when it comes to changing over a whole industry from casting and machining methods to a sheet metal working basis. The pioneer press-production industries making watches, locks, typewriters, adding machines and the like, used small presses only, for the most part, and accumulated these gradually as they expanded, so that the initial investment did not seem so great. But the newer applications involve the production of larger parts, which natur-

ally means large and expensive machines. A new body plant put in operation last year by one of the automobile companies required a press equipment which, exclusive of dies, cost considerably more than a million dollars. Very often the die or tool part of an equipment costs more than the presses themselves. Possibly the above is an extreme case for a single unit, but it gives an idea of the sort of initial investment figures that must be considered in this mass production method which continues making such strides.

Practically every job in pressed metal engineering is a problem by itself, due largely to the number of variable factors affecting the internal condition of the metal being worked, and due also to some extent to the variety in design of the tools. The tools for making an automobile crankcase may look very simple. Yet to perfect that one job costs thousands of dollars and the best efforts of expert press and rolling mill engineers. It often happens that to solve a new problem or to develop a set of tools for the best in finish, accuracy, or economy in the part a certain amount of experimental work is necessary. This is probably not the case in many other industries, or at least not to so great an extent, but plants are becoming accustomed to this condition as well as to the capital expenditure required and to the reality of the return resulting, which often restrains new ventures in this field.

In Fig. 1 is shown a corner of an automobile parts shop with various sizes and types of power presses engaged in producing brake bands. Intensive production on small automotive and electrical parts is shown in Fig. 2, and the type of heavy press employed for automobile body forming is shown in Fig. 3. The heavy duty press illustrated in Fig. 4 is engaged on the punching of holes in disk wheels. In many of the pressed steel parts the shape is difficult, but once the tool problem is solved, the cost of producing the piece per unit is usually less than the small cost of the metal required.

Modern office buildings are requiring more and more of the products of metal working machines, such as steel lath, edge beads, doors and trim, window frames, filing cabinets, lockers and furniture, all metal products of rolling machines, brakes and presses. The radio industry is another of the new industries requiring great numbers of presses. Elsewhere in the electrical industry manufacturers of washing machines, mangles, vacuum cleaners, cooking appliances and lighting fixtures continue to add to their press equipments, and the story is always one of increased production and increased man-hour efficiency.

Moral Hazard

By George F. Johnson

ZEKE LONGYEAR is a machine hand philosopher. In the cafeteria the other day the high cost of automobile insurance was the topic under discussion among the screw machine hands. Some one of the bunch, it appears, had been waylaid by an insurance agent who, thwarted in a sale, had just talked to his man. Among the items he mentioned that made the high cost of flivver insurance higher was "moral hazard" which term he left like a foundling on the threshold of his prospect's intelligence. The term appealed to the bunch and was held in reserve for Zeke's appearance.

Meanwhile and in the absence of a dictionary this novel two-word combination was a speculative mystery. "Moral" was extemporaneously defined as "well organized" and "hazard" was about evenly split between a golf term and the name of a blasting powder. But since "well organized blasting powder" did not seem to fit well into the costs of flivver insurance, Zeke's expatiation was appreciated.

"I dope it like this, fellers," observed Zeke. "I was readin' a while ago about some of the chances what occurs in all businesses and I seem to recall from that Foremanship book that there sweet soundin' combination. As I remember it has the meanin' of the chance what everybody has to take on everybody else's bein' honest. So I expect in fliver insurance it means that the company has to add somethin' on to what you pay as a kind of pertection against the feller what jambs his wagon on purpose to get a new set of fenders or a non-leak, replacement radiator free of charge. But, heck, we has moral hazards in machine shops, too, and don't you fergit it fer a minit.

"It's this-a-way. Like them Al and Ed birds would say in the *American Machinist*. Williams might put in a piece-work system and say, 'Hop to it, boys, and make as much as ye can. The more you make the more we earn, so step on it and we won't let Al or Ed or anybody else cut your rate.' But some o' them guys might ha' been stung before and made up their minds, Williams or no Williams, it ain't safe to make more'n five simoleons in any one day. You see how it is, don't ye? There ain't nobody what can make that there Williams nor anybody else in the management live up to his promise even though they swear to it on a stack o' bibles a mile high—they ain't no check valve on the line nowheres to prevent backin' up—and that there is a moral hazard. You're just trustin' to Williams' honesty and the company's.

"But, on the yuther hand, anybody what puts in one o' them there efficiency systems—whether they're Taylored or second-handed ready-mades—they knows just as well as you and me that it's the chance to get more jack what makes a man hump on his job. And if the men don't hump the limit 'cause they're afraid of a cut, 'cause they're just plain hog content with less than their limit, or 'cause the rest o' the bunch might make it hot for 'em, why that there's soldierin' and its a moral hazard just as much as the yuther, 'cause the company was trustin' to their honesty, too. And the only check valves there is is to get men what will go the limit, and then keep their promises to them.

"So, you see, there's two sides to the thing just like anything else, even the moon. But it's like the moon—it's up in the air and I don't know of any ways to bring it down to the horizon unless it's with some big idea what gets popular like a Golden Rule or square deal or straight shootin' all round. 'Cause, after all, if you ain't got no satisfaction in the boss, no confidence like, and he ain't got none in you, why you've got a pretty kettle o' fish, and I don't mean mebbe, no matter how many stop watches and arithmetic books you use to dope more production or less costs."

Material-Handling Appliances in a Modern Department

Parts carried by conveyors from the inspection department to the stockroom—How material is handled in the plating room—Vertical conveyors

INCLOSED by a wire screen in the center of the room occupied by the screw-machine department of the Gillette factory, is the parts stock room in which are temporarily stored all of the screw-machine products that go to make up the handle of the safety razor. The conveyor system that carries the work in its progress through the department delivers all such parts to this stock room, and an extension of the system takes up the burden of transporting them to further operations in other departments as they are checked out on shop order.

Dimly to be seen through the wires in Fig. 8, just outside and adjoining the wire screen, is the inspection bench mentioned in the preceding article. Openings in the metal-sheathed bench before each working position, permit the inspectors to sweep or drop the passed work into a pan on the rollers of the short transverse section of the conveyor here shown, one of which sections leads through the wire partition from each of the several working positions on the bench.

When the pan at any one of the stations has been filled, it is released by the inspector to roll by gravity to the main section of the conveyor, and thence to the scale upon which the weight is taken. An operator stationed here takes a record of the weight and nature of the parts in each pan, and gives the pan a push along the rollers to the inclined section beyond, where a power-driven belt raises it quickly to the top of the incline.

From here the pan rolls, again by gravity, around a reverse loop and comes back along an elevated runway to a point above the storage bins. The same operator without moving far from his position before the scale, checks the pan as it arrives, dumps its contents into

The second article. The third will appear in an early issue.

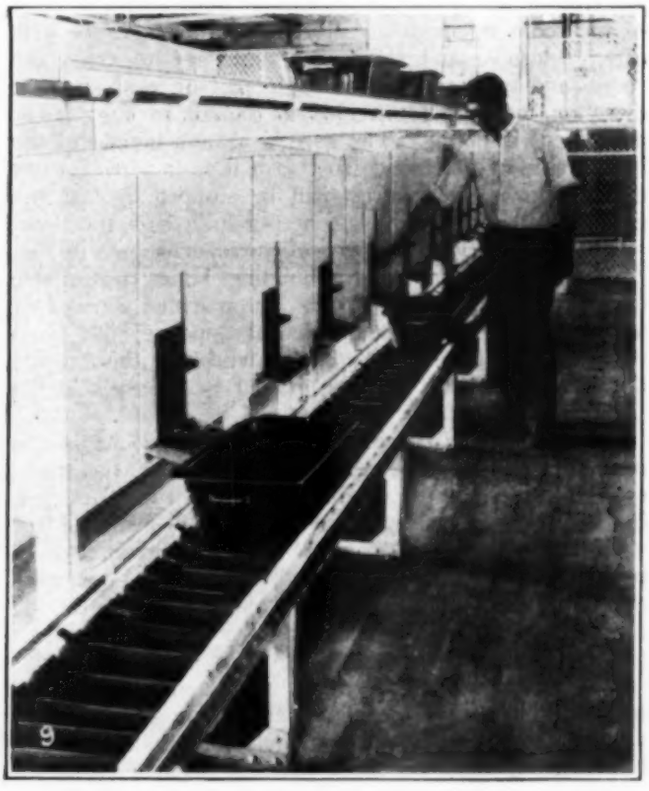


Fig. 8—A short section of the conveyor extends under the inspector's bench at each position, and as fast as the pans are filled they pass through to the parts stockroom to be weighed and deposited in bins. Fig. 9—Another section of the conveyor receives the pans of work as they are filled from the bins, and carries them to a vertical conveyor

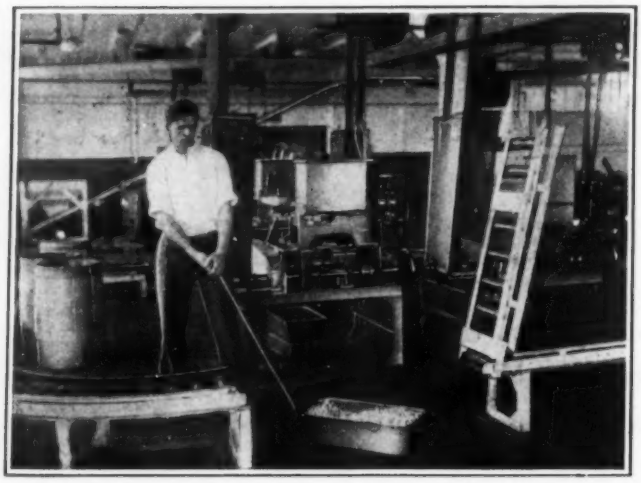


Fig. 10—Sometimes it is desirable to drag a pan of work across the floor, and to permit passage of the room in this direction the runways of the conveyors are provided with gates at frequent intervals

the proper bin and transfers the empty pan to an adjacent runway by which it is carried back to the washing machine to be refilled with parts.

The storekeeper checks out material to cover his shop orders from the opposite side of the row of bins. Pans placed on the runway before gates, as shown in Fig. 9, receive the parts when the gates are opened, and, when filled, roll down the incline to the right to a vertical conveyor that transports them to another floor and so out of the department.

Since there are several sections of the gravity conveyor extending the length of the room at heights varying from a few inches to six feet or more, cross passage of the room is effectively blocked by them. Since it is often desirable and sometimes necessary to cross the room, and even to drag a single pan of work in that direction, gates are provided as shown in Fig. 10 at convenient intervals. The gate is always hinged to the higher side of the incline so that a box or pan of work moving down the runway will be stopped against the gate instead of having its contents spilled on the floor.

The machinery of the vertical conveyor, shown in Fig. 11, is on the top floor of the building, but is controllable by push buttons on any floor. The machine consists of a series of platforms suspended at opposite ends from two chains that run over sprocket wheels at the top and bottom of the shaft and are guided by channels in the framework.

The chains run continuously when the mechanism is started, the platforms rising on one side of the shaft, swinging over the top of the division wall and descending on the other side. The conveyor is available for vertical transportation of work in either dirceiton or in both directions at once. In ordinary service, operators are stationed at both the loading and discharging floors, one putting the pans, racks or trays on the platforms and the other removing them at their destination.

The conveyor is double, one unit extending from the top to the bottom of the nine-story buliding and serving all floors. The other unit is in two sections, one section reaching from the screw-machine department on the fifth floor to the plating room on the ninth, and the remaining section immediately below and in the same shaft, to serve the lower floors.

On the floors between the screw-machine department and the plating room are the blanking and stamping presses for turning out the flat parts, machinery to perform subsequent operations and finally to assemble the parts of the handle; polishing, buffing, burnishing and lacquering to put on the finishing touches; and machines to pack the handles in boxes. All of these departments are served by one or other of the vertical conveyors.

In the plating room there is no material handling machinery except the vertical conveyors and the plating machines, which are conveyors in themselves. The work to be plated is delivered from the vertical conveyor to a bench at which a group of operatives is engaged in placing the individual parts on the plating racks, and removing plated work from other racks to arrange it in trays for the subsequent operations of polishing and buffing.

There are three of the plating machines, one each for gold, silver and nickel. They are alike, mechanically, the one shown in Fig. 12 being the silver plating machine. It is the duty of one of the group of operatives at the bench to hang the filled racks on the carrier and to take off those containing plated work for unloading and reloading with work to be plated.

The plating machine consists of a double row of tanks of various lengths, over which is a framework of steel to support the lifters and also to carry a chain composed of specially-shaped links and the mechanism to drive it. The chain is so located that its line of travel is practically over the center line of both rows of tanks, passing down the line above one row, around a sprocket of large diameter at the farther end, and back over the other row of tanks to a similar sprocket. The length of each of the several tanks is so calculated with reference to the rate of travel of the slowly- and continuously-moving chain, as to leave the work in the various solutions for the predetermined length of time.

Beside the chain is a stationary track upon which travels a number of small-wheeled trolleys, moved, but not supported, by the chain. From each trolley there depend two flat bars of copper, terminating in crossbars upon which the racks holding the work to be plated are hung. The lengths of the depending bars and the racks are so caclulated that when the wheels of the trolleys are on the track, the work on the racks will be completely immersed in the solutions.

Above each division wall where the tanks adjoin, and

Fig. 11—A vertical, or ladder conveyor is provided to transport the work from floor to floor. It operates continuously and is available at any time to carry work in either or both directions

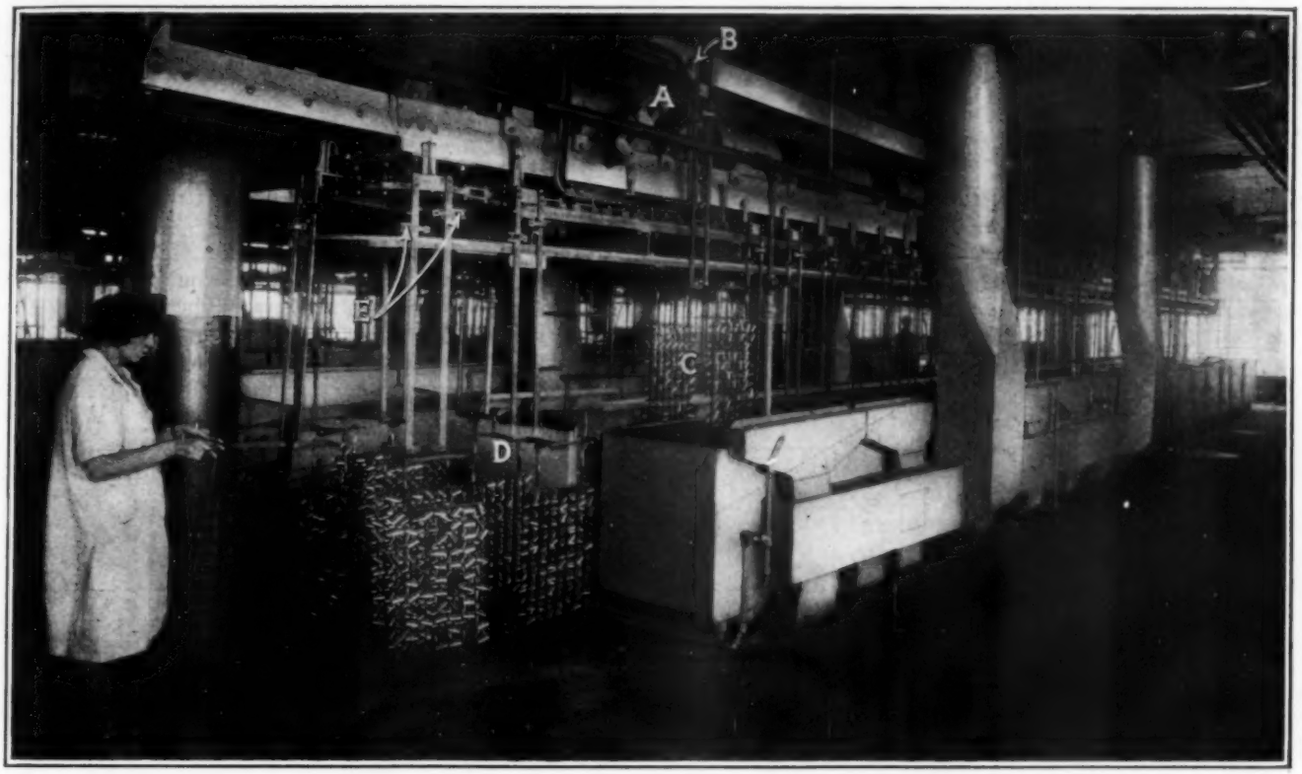


Fig. 12—There are three of the automatic plating machines, one each for nickel, silver and gold. Girls place the parts to be plated on racks, which are then hung on the carrier of the machine to be carried through the various solutions and returned to the starting point. As each rack is taken from the carrier it is replaced by another.

at the end of the row of tanks where the work enters and emerges, there is a "lifter," one of which may be seen at *A* in Fig. 12, to raise the racks out of one tank, pass them over the dividing wall and immerse them in the solution of the next tank. The arm of the lifter rotates slowly in clockwise direction in synchronism with the movement of the chain. Within the arm is a sliding bar carrying at its outer end a roller that is guided by the rectangular channel surrounding the arm, so that while the arm makes one complete rotation, the roller at the end of the sliding bar describes a path that is approximately a square.

The mechanism is so timed that the roller on the end of the sliding bar arrives at the lower left-hand corner of the square at the same instant that one of the trolleys on the chain reaches a coincident position. As the roller rises in the ascending side of the channel, the bar engages the hooked extension *B* of the trolley and lifts it off of the chain and track to a height equal to the height of the square, transfers it forward (quickly in relation to the movement of the chain) and drops it into engagement with a link of the chain considerably in advance of its former position. In this movement the racks of work depending from the trolley have been lifted, as at *C*, over the division wall and deposited in the next tank in the series.

The last tank at *D* contains no solution, but instead is lined with coils of pipe in which live steam is circulated, so that the work in its slow passage through this section is quite dry before being lifted over the end wall. For several minutes the racks are suspended in open air at this end of the circuit, giving the operator ample time to remove those containing plated work and to replace them with other racks containing work that is to be plated.

At the end opposite to the one shown, a tank of double width occupies the space that here is open, so that while the work is passing around the opposite sprocket it is suspended in clear water preparatory to being lifted into the plating solution, which is contained in a long tank covering nearly the whole length of the row on the returning side.

The reason for making the suspender rods of copper is that the electric current necessary to the plating operation is transmitted through them. Over each tank wherein electric current is required there is a strip of copper attached to, but insulated from, the framework, and connected by wires to the electric generators. Copper brushes that may be seen attached to the suspender bars at *E*, contact with these strips to convey the current to the work.

About Forty-Five Years Ago

(From early numbers of the *American Machinist*)

THE Weed Sewing Machine Co., of Hartford, Conn., has turned out 855 bicycles, and has orders for 1,700 more.

A meeting of prominent engineers from eight states was held at the office of the *American Machinist* on Feb. 16, 1880. The meeting was called to order by Prof. John E. Sweet, and after some discussion and much enthusiasm, an association was formed which will be called the American Society of Mechanical Engineers.

E. P. Bullard, of New York, has fitted up a shop in Bridgeport, Conn. Mr. Bullard has given up the steam-engine business altogether for the purpose of building and selling strictly first-class machine tools.

Simple Resuscitation Method for Use in the Plant

By Sydney W. Ashe
Supervisor of Education and Welfare, Pittsfield Works, General Electric Co.

THE prone pressure method of resuscitation is the standard method of artificial respiration. Its value lies in its simplicity, the fact that a 16-year old boy can resuscitate a full grown person and that no supplementary apparatus is required. It is equally applicable in drowning cases, heart failure, electric shock, gas asphyxiation, or any case of suspended breathing. The method has been successfully used for 15 years at the Pittsfield plant of the General Electric Co., and many lives have been saved by it. Everyone in a plant should be familiar with the method. The principle of this method of resuscitation is based on the fact that when we breathe, rather than draw the air into our lungs as we think we do, we simply pull down a muscle called the diaphragm extending across the abdomen and then the atmospheric pressure fills the lungs. When we relax the diaphragm the air is expelled. When a person is unconscious the lungs are partially filled with a mixture of air and carbon dioxide, and the problem becomes one of getting the impure air out of the lungs and allowing atmospheric pressure to fill them with pure air.

This artificial breathing is accomplished by laying the person prostrate, with head turned to one side, and with arms over head, straddling them with knees about hips, and then pressing in with the palms of both hands on the ends of the lower or floating ribs. This position is shown in Fig. 1, where the operator is using his thumb to press in on the ends of these ribs. The position lies over what we term the small of the back, or the place where we can feel a little depression if we press in with our thumbs.

Fig 1—Showing location of floating ribs

In the illustration of the skeleton, Fig. 2, it will be noted that the hands are placed well out so as to come over the ends of the floating ribs. The thumbs should be parallel with the other fingers as shown in the illustration. When the operator presses forward, the ends of the floating ribs act like a pump handle, pressing up against the diaphragm and expelling the air. When the operator swings back, taking care not to take his hands from the body but simply release the pressure, atmospheric pressure fills the lungs. The operator swings back and forth about 16 times a minute, expelling the air mixture at the same rate as he breathes. Extending the arms over the head increases the capacity of the lungs about 30 per cent, and turning the head to one side keeps the tongue from falling back and closing the throat, once the tongue has been pulled forward.

Fig. 2—Proper location of operator's hands on ribs

The operation of resusitation is as follows: Every possible second should be saved and no time wasted in looking for apparatus of any sort. The unconscious person should be turned over on his stomach, stretching arms over the head, and resting the head on one arm. Turn head to one side. Straddle the patient with knees about hips and place the hands over the small of the back. Hands should not press on the back bone, or hip bones, and should be well out. Exert pressure with the palms of hands, not the fingers.

Press forward, and then swing back, releasing the pressure and using the knees as a fulcrum. Do not take the hands from body in swinging back. When the patient starts to regain consciousness take care to adapt yourself to his rate of breathing, not pressing the air out of him when he is trying to breathe it in.

In drowning cases it is not necessary to roll the unconscious person over a barrel or use any other method than the prone pressure method as this will bring up the water from the lungs. The general success of the method comes from practicing it frequently on all kinds of backs so that in time of emergency the operator will know from constant practice that he is doing it right, and have confidence that if there is the slightest chance he will bring the person back to consciousness.

It is time we preached less about independence and realized more about how much we depend on each other. Neither the farmer, the mechanic nor the business man can be independent of each other.

Automotive Production

The Air-Cooled Radial "Wasp"

Tools and fixtures for machining pistons

By Ellsworth Sheldon
New England Editor, American Machinist

BEFORE going to the machine shop, the aluminum castings from which the pistons of the "wasp" engine are made are normalized by heating them to a temperature of 400 deg. F. for three hours, and allowing them to cool off in the furnace. The first machining operation to be performed is to bore and face the open end, which is done in a standard engine lathe. For this purpose the casting is grasped as shown in Fig. 38 by the four jaws of an independent chuck, while single-point boring and facing tools in the toolpost do the work. For two reasons the tolerance on both diameter and length is small: the bore is depended upon to locate the piston in subsequent operations, and the length of the skirt has an important bearing upon the finished weight of the piston. The cross-hole for the piston pin is drilled at an early stage, for the reason that the easiest and most logical way to hold the casting for subsequent operations is by means of a loose pin through this hole and a drawbar in the machine spindle. In Figs. 39 and 40 may be seen the fixtures in which the pistons are held to drill the holes and to face the inner ends of the bosses. The two operations are conducted as one in a two-spindle Leland & Gifford drilling machine.

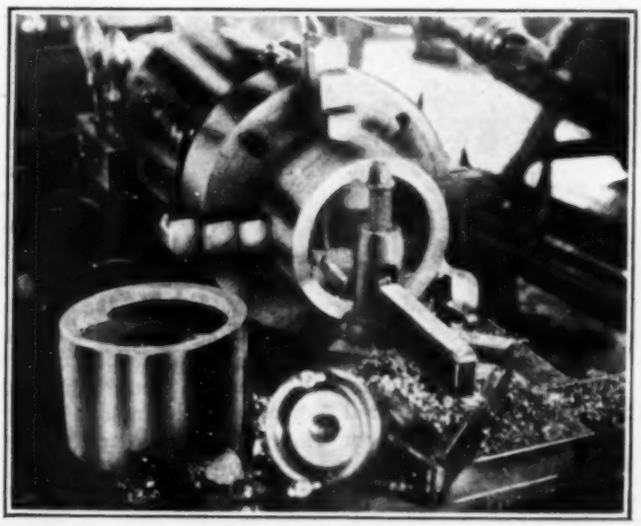


Fig. 38—The skirt of the piston is bored to fit the holding fixtures used in subsequent operations, and the casting is faced to length. Close limits are necessary

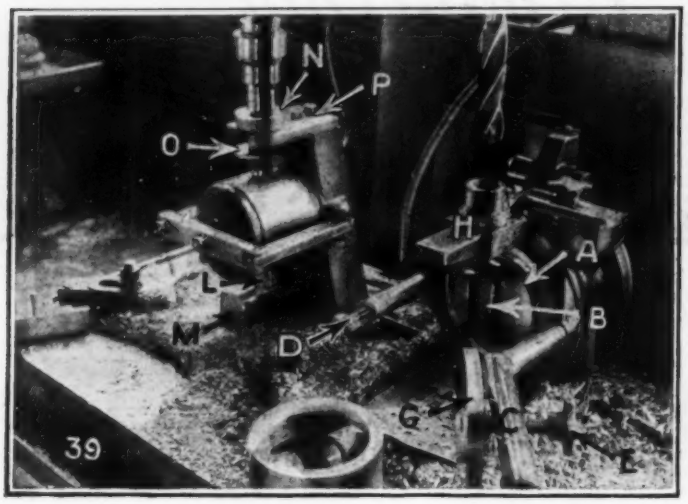
The drilling fixture is shown open in Fig. 39, ready to receive the piston. The bore at the skirt end of the piston fits snugly over the short shoulder at *A* with the faced end of the casting bearing upon the adjacent surface. The rectangular plunger *B* slides endwise through the horizontal center of the fixture, presenting to the bosses of the piston two projections with deep V-shaped notches. A stiff coil spring pushes this plunger forward a short distance beyond its normal position, so that when a piston is put on the fixture, the bosses come to a bearing in the V-shaped notches before the bored end of the skirt reaches the shoulder that aligns it.

This makes it necessary to compress the spring of the plunger slightly before the piston is fully seated, thus insuring that the bosses will be brought to coincide with the vertical center line of the drill. Compression of the spring is easily effected by swinging the retaining leaf *C* of the fixture to place and securing it by a quarter-turn of the latch *D*, and then applying pressure to the piston by means of the hand-screw *E* and the circular plate *G* attached to it. Reference letters here used apply to both illustrations. When the faced end of the piston has been brought to bear upon the locating surface surrounding the plug *A*, but before pressure sufficient to bind the piston has been applied by the screw *E*, the operator grasps a knob on the rear end of plunger *B*, pulls the plunger backward a short distance and releases it. This causes the plunger to snap sharply against the bosses of the piston, so that if they are not exactly in line with the drill at first, the violent contact of the V-shaped notches with the bosses will cause the piston to turn slightly upon its axis until they are so. This movement is repeated two or three times before screw *E* is finally tightened.

The fixture is in two main parts: one being an angle plate, clamped to the table of the drilling machine and carrying the hinged bridge *H* in which is the bushing to guide the drill; and the other consisting of all the piston-carrying, locating and clamping parts mounted upon the angle plate in such manner as to be rotatable about a horizontal axis. The bridge *H* is the latch that locates that part with the bosses in true vertical alignment. The two bosses are drilled separately, the rotatable part of the fixture being turned 180 deg. between operations.

The eighth article. The ninth will appear in an early issue.

Automotive Production



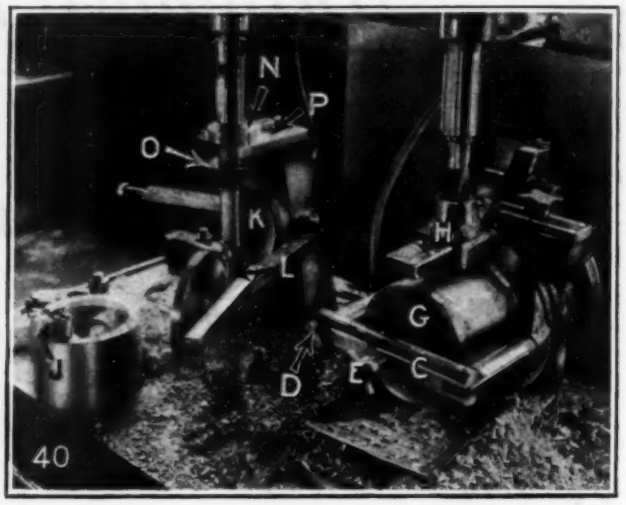


Fig. 39—Drilling piston-pin holes and facing bosses. Drilling fixture open, facing fixture closed. Holding part of fixture is rotatable and is turned over to drill the second boss. Fig. 40—Drilling fixture closed, facing fixture open. This fixture does not rotate. Both bosses are faced at one setting by the double-end tool seen on the piston

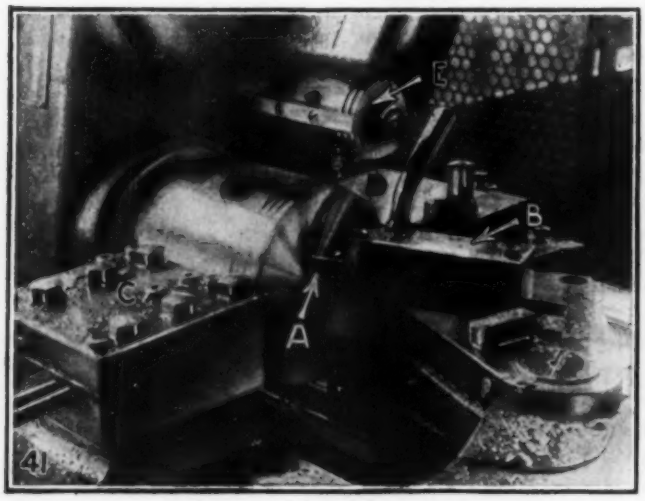
The fixture to hold the pistons for facing the bosses is shown closed and open, respectively, in the same illustrations. The double-end facing tool may be seen at *J* in Fig. 40, on the skirt of the piston. The shouldered locating plug *K* is secured to the upright portion of the fixture and has no movement. The piston is secured upon it in the same manner as in the drilling fixture, but is located circumferentially by the toolbar passing through the drilled holes.

The toolbar is of two diameters: above the loose body of the facing tool it fits the drilled hole in the piston; below it, it fits a bushing which may be seen at *L* below the piston. This bushing *L* is secured in a round plug *M* that is free to slide endwise and to make a partial turn in its seat in the body of the fixture. In Fig. 40 the bushing *L* is shown in its normal working position.

To place a piston in the fixture the toolbar is laid aside, the plug *M* and bushing *L* drawn forward a short distance, and the drilled hole in one side of the piston is set over the bushing. The toolbody *J* is then placed between the bosses in its working position and the toolbar entered, passing through the upper hole in the piston, through the toolbody *J;* and its smaller diameter entering the bushing that now fills the lower part of the hole.

In the smaller diameter of the toolbar is a cross-pin that projects not more than $\frac{1}{8}$ in. on one side only. The toolbody *J* is splined to permit the passage of the cross-pin, clear through if necessary. Midway of the bore of the toolbody is a short groove, spline, or keyway, extending at a right angle to the spline in the direction of forward rotation. When the toolbar is entered in the work and tool, the cross-pin is brought opposite to the entrance of this right-angled groove and the bar is given a partial turn forward, thus securing the toolbody against longitudinal movement on the bar in either direction, and also against further relative rotation so long as the bar turns in the direction of the cut.

When the tool parts are assembled in the piston, the



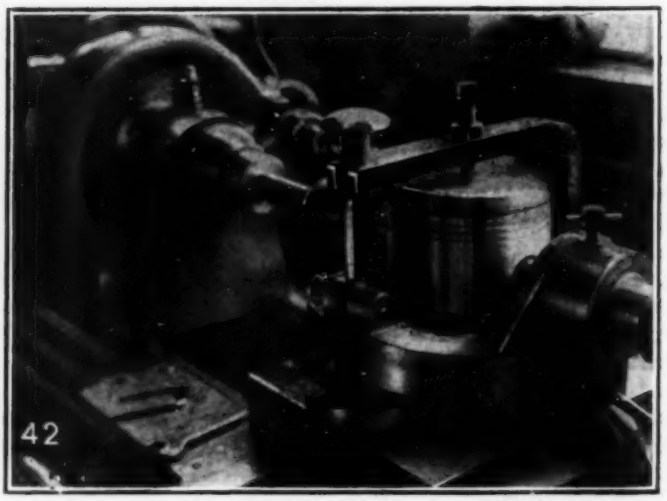


Fig. 41—Pistons are turned and grooved in two operations, performed upon Sundstrand lathes. The machine shown here is the finishing lathe, in which the grooves are finished to exact width by burnishing. Fig. 42—Piston-pin holes are finished by boring. There are two identical operations, in which the boring bar is aligned by fixtures that are attached to the carriage of the lathe and are driven through a universal joint

Automotive Production

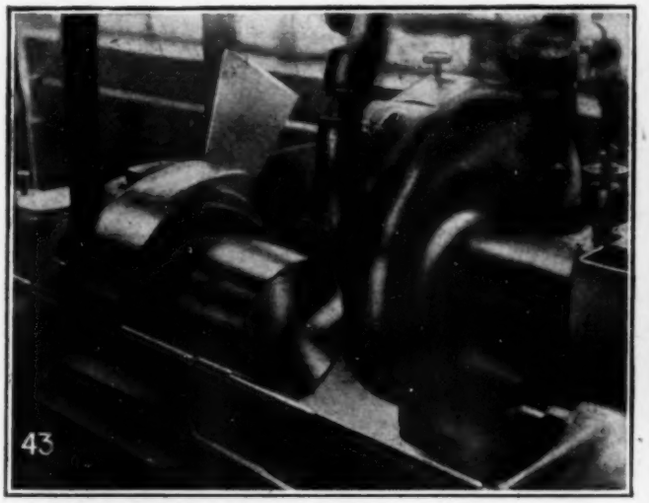


Fig. 43—Pistons are centered in the grinding machine by the bore of the skirt and held to the fixture by a draw-bar with a pin through it and the piston-pin holes.

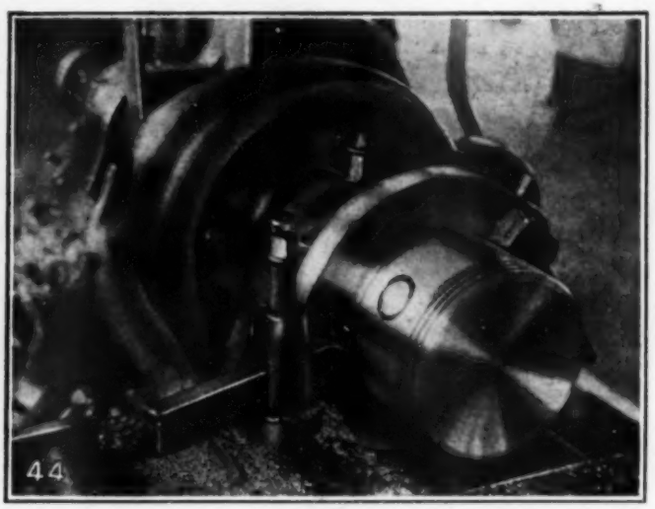


Fig. 44—A similar fixture is used in a lathe to hold the pistons to turn the eccentric relief over the ends of the pin holes. Fixture is mounted eccentrically and located by dowels

piston may be advanced to its seat on the shoulder *K*, the plug *M* sliding in its seat to permit this movement. When the piston is finally secured to its seat in the fixture, the toolbar and bushing *L* are in line with the machine spindle, and the bar may be secured in the slip collet. Adjustable collars *N* and *O* on the shank of the toolbar, above and below the fixed yoke *P*, limit the vertical movement of the bar in both directions, so that both faces are machined at one setting by an upward and downward movement of the machine spindle. The adjustable collars determine the distance between the faced bosses, and also provide adjustment to compensate for tool wear.

The outside diameter of the piston is turned and the head concaved in two operations performed in Sundstrand stub lathes. The tooling and movements are identical except that in the finishing lathe, which is the one shown in Fig. 41, there is a set of burnishing rollers to finish the sides of the ring grooves. The concaved top of the piston is machined by a toolbit at *A* in the end of the radius bar *B*, which is connected to, and moves with, the front toolslide.

The front toolslide *C* traverses lengthwise of the piston, turning its three diameters as indicated by the positions of the turning tools. The rear toolslide *D* (in both lathes) moves crosswise of the lathe, and its tools cut three ring-grooves at the head end and one groove at the skirt end of the piston. The grooving tools of the finish-turning lathe leave the grooves about 0.001 in. narrower than the specified width, and when they have receded from the work, the hardened and ground burnishing rollers *E* are brought down by hand to burnish the sides of the grooves.

The rough-drilled piston-pin hole is bored twice, both operations being performed in the same fixture, which is shown in Fig. 42, but with several other operations intervening. The boring bar, in which is a single-end tool, is carried in bushings in the ears of the fixture and is loosely connected with the spindle of the lathe, which has no other function than to rotate the bar and feed the work. The alignment of the bar with the work is brought about entirely by the fixture.

The operations intervening between rough and finish boring the piston-pin holes are: countersinking the outer ends of the holes; grinding the outside diameter, shown in Fig. 43; and relieving surface over the ends of the pin bosses, which is done, as shown in Fig. 44, with the piston held on a faceplate fixture in an engine lathe.

In this lathe, as in the grinding machine, the piston is located by fitting the bored end of the skirt over a shouldered plug and seating it thereon by means of a drawbar through a cross-hole, in the outer end of which and the hole in the piston a temporary pin is passed.

The final operation, shown in Fig. 45, is to balance the piston to its exact weight of 3.03 lb. This work is done on a Pratt & Whitney shaving lathe with the piston held in an ordinary lathe chuck. In this illustration may be seen one of the wooden containers in which the pistons are kept and transported while being handled through the various operations.

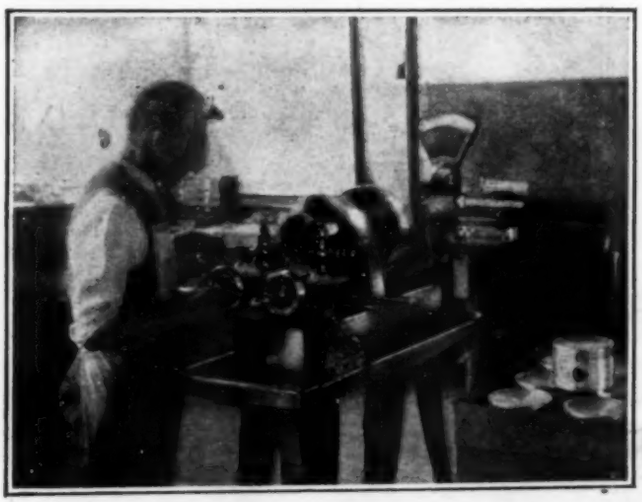
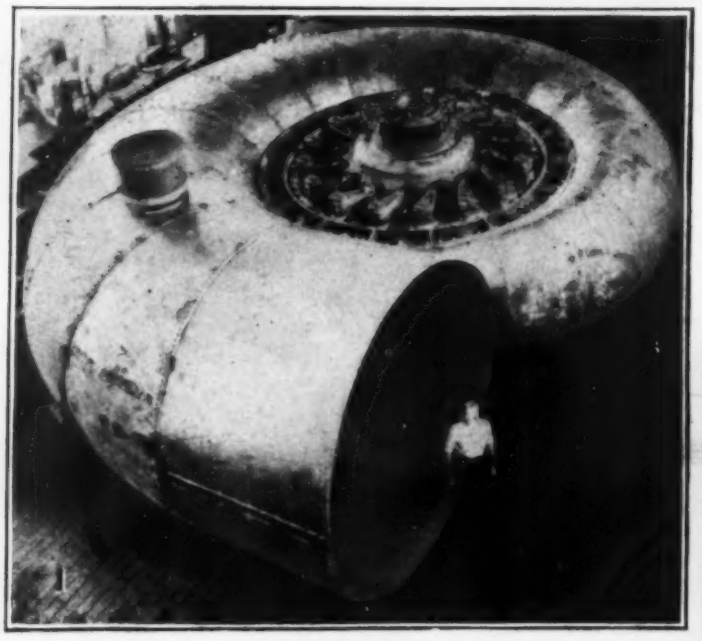


Fig. 45—It is necessary to hold the weight of the pistons within close limits. For this purpose the operator is provided with a weighing scale so that he may remove just the right amount of metal from the casting

Large Water-Turbine Work



1—Sheet-steel, spiral turbine case with top and bottom plates in place. The sheets are laid out in the flat, the holes punched and the sheets curved to proper shape. The ends fit into each other and the holes match for final riveting. It is a splendid piece of plate work. Note size from the man

2—Boring the top plate. After the holes have been laid out, the plate is mounted on a turntable, bringing hole-circle directly under the spindle of the machine. The boring bar is guided both above and below the plate by bushings suitably held. Both the upper and lower holes are bored at the same setting

Photographs by courtesy of the S. Morgan Smith Co., York, Pa.

Details of Jigs and Fixtures

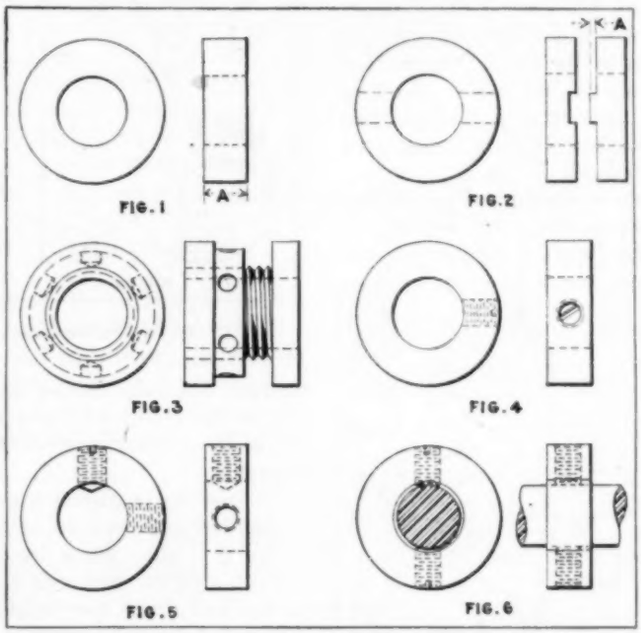
Design of Collars

By J. A. POTTER

Collars are essential features of jigs and fixtures, and care must be used in their design as well as accuracy in their construction

THERE are various uses for collars in jig and fixture design. Some are locked or pinned to the shaft, others are intentionally made loose, and still others are used for the spacing of cutters on a milling machine arbor under various conditions.

A washer is considered the most simple form of a collar, although a collar is usually made to more accurate dimensions than a washer, and has greater width. The collar, as illustrated in Fig. 1, is used on arbors for spacing cutters, the dimension *A* varying to suit conditions, the hole and sides being ground. Usually several collars are made for an arbor so that different spacing can be obtained, and also for the reason that an extra long collar is difficult to machine and to keep the ends square with the axis. Collars for arbors can be made of cast iron or steel, and may be either hardened or left soft, as preferred. In Fig. 2 is illustrated a set of collars used on a milling machine arbor for roughing and finishing cutters, the tongue of one collar fitting the groove in the other. In roughing out a slot the collars can be placed with the tongue in the groove. After the required number of parts have been run through the fixture the collars on the arbor can then be loosened without removing, and the collar given a quarter turn, which will space the cutters at the correct distance apart for finish milling. This operation should be reversed for straddle milling. The distance *A* can be varied so that the required amount of stock will be allowed for finish milling.



Figs. 2-6—Plain and adjustable collars and spacing washers

Another adjustable collar, shown in Fig. 3, can be used under the same conditions as the collar in Fig. 2. It has an advantage in that it has a larger range of variation, and is not fixed for any set distance. It can be operated either by the use of a spanner wrench as shown in the illustration, or it can have flats milled on the diameter, so that an open end or monkey wrench can be used on it.

The common setscrew collar is shown at Fig. 4. This type of collar is used for positioning parts on a shaft. It can be adjusted lengthwise on the shaft, and is held in position by the setscrew, which may be either of the head or headless type, according to the condition under which it is used.

A better setscrew collar is shown at Fig. 5, with two setscrews set 90 deg. apart. One setscrew has a cone point engaging a vee slot cut in the shaft, which stops the collar from turning, while the other setscrew clamps the collar to the shaft, and keeps it in position longitudinally. This type of collar can also be used with two single setscrews without grooving the shaft. The collar in Fig. 6 should never be used, since the two diametrically opposed setscrews do not hold the collar as well as a single setscrew. If the shaft were smaller than the hole in the collar, as in the sketch, the collar would ride on the setscrew instead of on the shaft, and any side pressure on the collar would cause it to move, making the screw ends score the shaft, thus injuring it permanently.

The pinch collar illustrated in Fig. 7 is more positive in holding than either of the setscrew collars, but costs more to manufacture. By binding the screw, the whole wall of the collar offers a friction surface to any movement on the shaft. A pinch collar with a threaded hole is shown in Fig. 8. This style of collar is used in tool work for stop tools, as it is positive in its action, at the same time being adjustable lengthwise on the shaft. It is often used on the shanks of counterbores, countersinks, hollow mills, and line reamer collets. Sometimes pinch collars are made eccentric, as in Fig. 9, so that more stock can be allowed for the screw. A point to remember in designing pinch collars is to make the counterbored surface with an end-mill cut as shown at *A*,

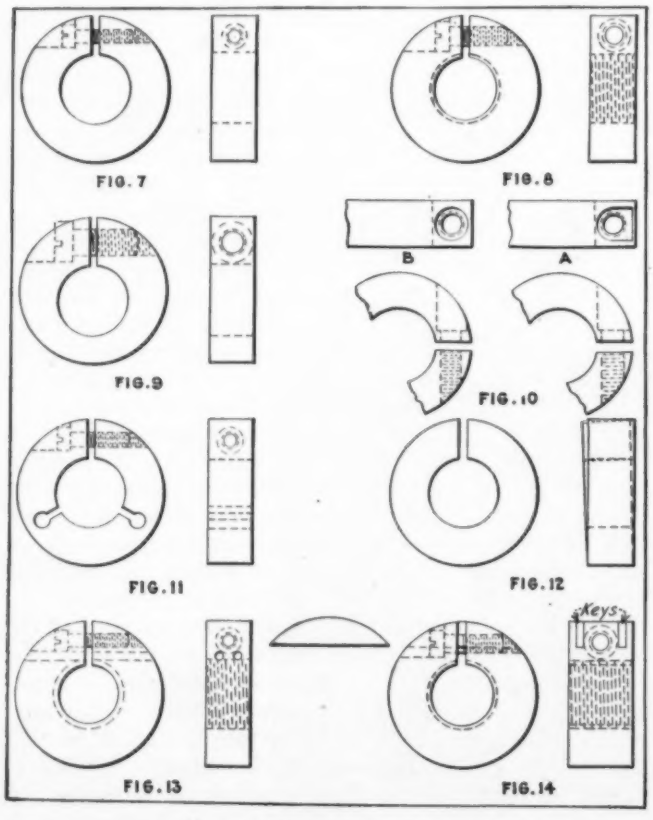
The third article. The fourth will appear in an early issue.

Fig. 10, rather than as shown at *B*, since it is hard for the toolmaker to start a drill on the curved surface. Large pinch collars are sometimes stiff, and will not spring. This can be overcome by drilling two holes 120 deg. apart, as in Fig. 11, and making two saw cuts through to the holes.

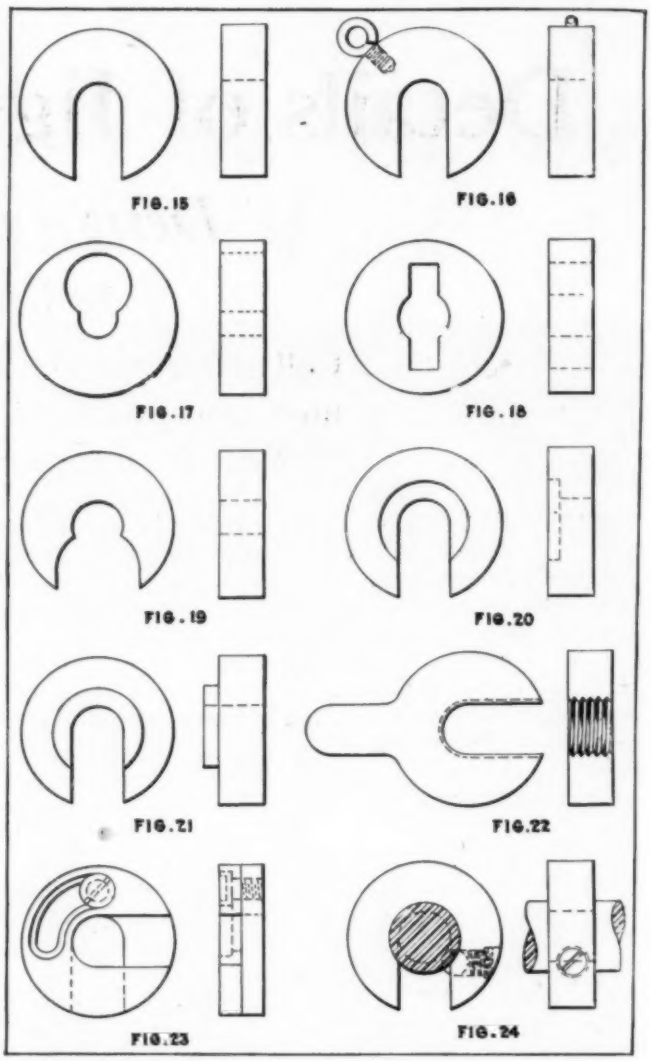
When collars are split and then hardened, there is a tendency to wind, or go out of shape, as shown exaggerated in Fig. 12. This condition in a thread gauge would throw out the lead, and change the shape of the thread. Therefore, it is customary to use one or two pins as shown at Fig. 13. In this case the pins act as guides to keep the walls in proper relation to each other, since the pinch screw cannot be depended upon to act as a guide. A still better construction is to mill two slots each side of the pinch screw and drive an inverted Woodruff key into each slot. The drive should be on one side of the keys only, as the other side must be free to slide in slots. The illustration at Fig. 14 brings out this construction. The keys have the disadvantage, however, of making the collar wider than the collar with pins.

A collar familiar to toolmakers and designers is shown in Fig. 15. This is known as the split collar, or washer, and is used on studs and arbors. It is put on and taken off by pushing in or drawing out from under a nut or collar screw. This means rapid operation, as only a quarter of a turn of the nut or screw is sufficient to bind the work in place. The split washer can be either plain, knurled, or grooved on its outside diameter to suit the condition under which it is to be used. A reason that the split collar is not used more is due to the fact that it is easily lost. This can be overcome by the addition of a screw eye, Fig. 16, and a short chain attached to a convenient part of the jig or fixture.

A collar similar in action to those shown in Figs. 15 and 16, known as the keyhole collar, is illustrated in Fig. 17. This collar is dropped over the head of the screw, and pushed sideways under the head until the small slot strikes the shank of the screw. It will not slip entirely out as the other two types do if the screw should become loosened.



Figs. 7-14—Types of collar clamps



Figs. 15-24—Removable types of collars

In Fig. 18 is shown a collar that can be slipped on a boring bar and over the cutters while they are in position, forming a stop when boring a hole to a rough depth, after which the collar is removed, letting the cutters go to the full depth for finishing. The split collar at Fig. 19 can be slipped from under the head of a screw or nut with very little side movement. The grouping of clamps or handles on tools are sometimes very close, and a split washer of this type will be found useful.

A safety split collar, having a counterbored recess on the face, is illustrated in Fig. 20. This collar is slipped under the screw head in the same way as for the other split collars, but the head of the screw then makes an additional turn thereby locking the split washer in position. This type is valuable for lathe fixtures, or for rotating parts on machines, and it often makes easy a difficult dis-assembling job. A similar safety split collar is shown in Fig. 21. This collar has a raised shoulder, which engages a counterbored recess in the work, instead of having a counterbored recess for the screw head. In Fig. 22 is illustrated a split binding collar, this collar is first tapped, then slot milled to tap-drill size, and threads cut into the tapped portion by the use of a small stem

cutter. Although this piece is usually made with a handle, it comes under the classification of collars.

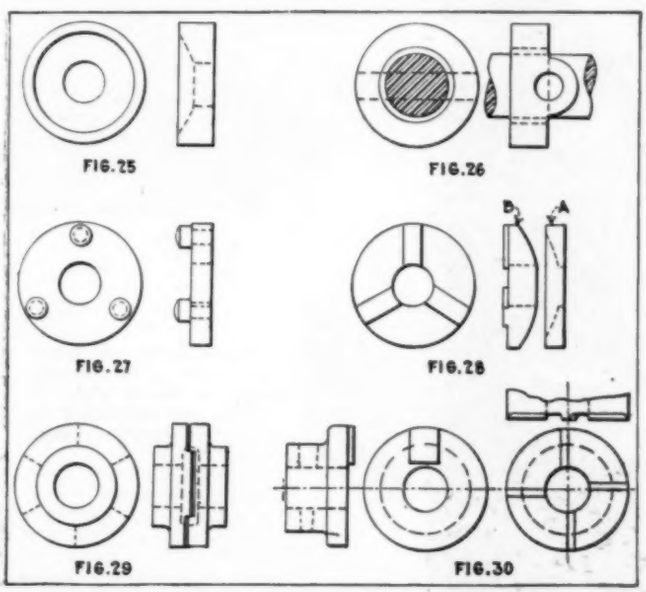
Two split collars, held together by a shoulder head screw located in a curved slot, make up the collar shown at Fig. 23. This collar can be slipped over the shaft, one collar being given a turn of 90 deg., after which the screws are tightened. This collar makes a good stop for use on boring bars. A split collar equipped with a ball and spring is shown at Fig. 24, and illustrates another type that can be used on boring bars. Both of these types of collars should be used in a groove turned on a boring bar, the groove being a slip fit for the width of collar.

The collar at Fig. 25 has a curved, or ball seat, and is useful on three-point or rocker clamps. A collar, Fig. 26, with a large clearance for the shaft, and swinging on a pin driven through the shaft, constitutes a form of equalizer that is often used on push rods.

A three-point bearing collar is illustrated at Fig. 27, this collar having three pins driven in to clamp the work. The central hole should be larger than the shaft. Sometimes this collar is used in conjunction with the one shown in Fig. 25. A three-point bearing collar may have a curved surface on the back, and be located in a ball-seat collar as illustrated in Fig. 28. This combination gives an excellent fixture for broaching rough cast-iron parts. The collar *A* should be screwed and doweled to the broaching fixture, and *B* should be floating.

Two collars, as shown in Fig. 29, either pinned or screwed to shafts, make a form of clutch, the teeth of which can be made to suit working conditions. A collar with a hub on one side and a ground raised spot, is often used in gage construction. This is shown at Fig. 30. A collar with two, three, or four ground raised spots with notches cut out, forms another type for gage collars, the idea being to lessen friction, and to form a sighting edge when the ground edges are bearing against the head of a ground bushing.

Most of the collars illustrated are commonly used in jig and fixture design, and are generally hardened and ground in the hole and on the two sides. Therefore, such collars should not be made thin. An approximate ratio is to have the thickness about one-third of the diameter. Collars are often knurled on the outside diameter, but it would be better if all knurling were omitted in collars, push pins, or any other component used in jig and fixture design, particularly if the tool is to be used for parts made of steel. As these parts must be handled continuously, and are likely to be covered with oil or cutting compound, a knurled surface is very detrimental to the fingers of the operator.



Figs. 25-30—Forms of clamping collars

Why Use Slotters in Railway Shops?

By M. H. Westbrook
Shop Superintendent, Grand Trunk Shops

I HAVE just returned from those wonderful displays of machine tools on exhibition at Cleveland and Detroit where I found but one slotter exhibited. Even that was disguised under the name of a vertical shaper. The exhibits confirm my opinion of slotters in general.

Ever since I was a cub machinist, I thought the slotter about the most inefficient and unsatisfactory of all the metal cutting tools I was ever called upon to operate. If it was ever at all possible to do the job on any other machine, I always endeavored to do so. This was before milling machines, both vertical and horizontal, were developed to their present state; and also before shapers, both ordinary and draw-cut, had been brought to their present highly efficient state. Naturally I do not expect everyone to agree with me. But it seems as though the only job on which a slotter is now of any use in a modern railway shop, is in cutting keyways in driving wheels and work of that kind.

Six Hours to Slot Forked Ends

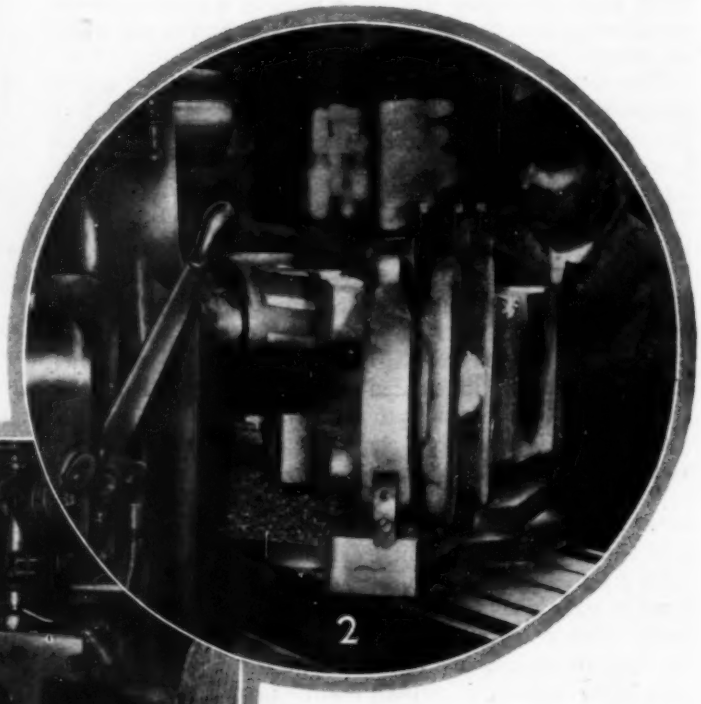
I can well recall seeing fork ends of side rods slotted out, taking from 4 to 6 hr. And this after a 2-in. hole had been drilled first, taking another half-hour. This work is now being done on a milling machine in less than an hour and no drilling is necessary. Slotting around the ends of a pair of side rods took a whole day, now a good vertical milling machine does it in less than one-third the time. Frame binders were slotted and extra cuts had to be taken to relieve spring of the tool. This work is now done on a good shaper in half the time. Main rod brasses were slotted on all four sides to fit straps, taking 1½ hr. per pair. Now a planer does them, set up in a row, in less than 1 hr. per pair.

Main frames were slotted for shoe and wedge fits, extra cuts being again necessary on account of spring of tool. They are now machined on a draw-cut shaper in at least 30 per cent less time than by slotting. Driving boxes and crown brasses take almost twice as long to machine on a slotter, even with a competent operator. The same man can cut the time on either job at least forty per cent if he uses a special shaper. And so on all through the list of what used to be considered as regular slotter work.

I would like to see the matter discussed in your columns solely on the merits of the machines in question. If others can show slotter performances to equal the times given, I should like to see it. My only object is to help railway shops secure the best possible machine tools for the work to be done.

Castings and forgings that have been sandblasted are much better to handle than those that come to the shop straight from the foundry or forge. Some shops use this method very largely, others not at all.

Steps in Machining a Housing



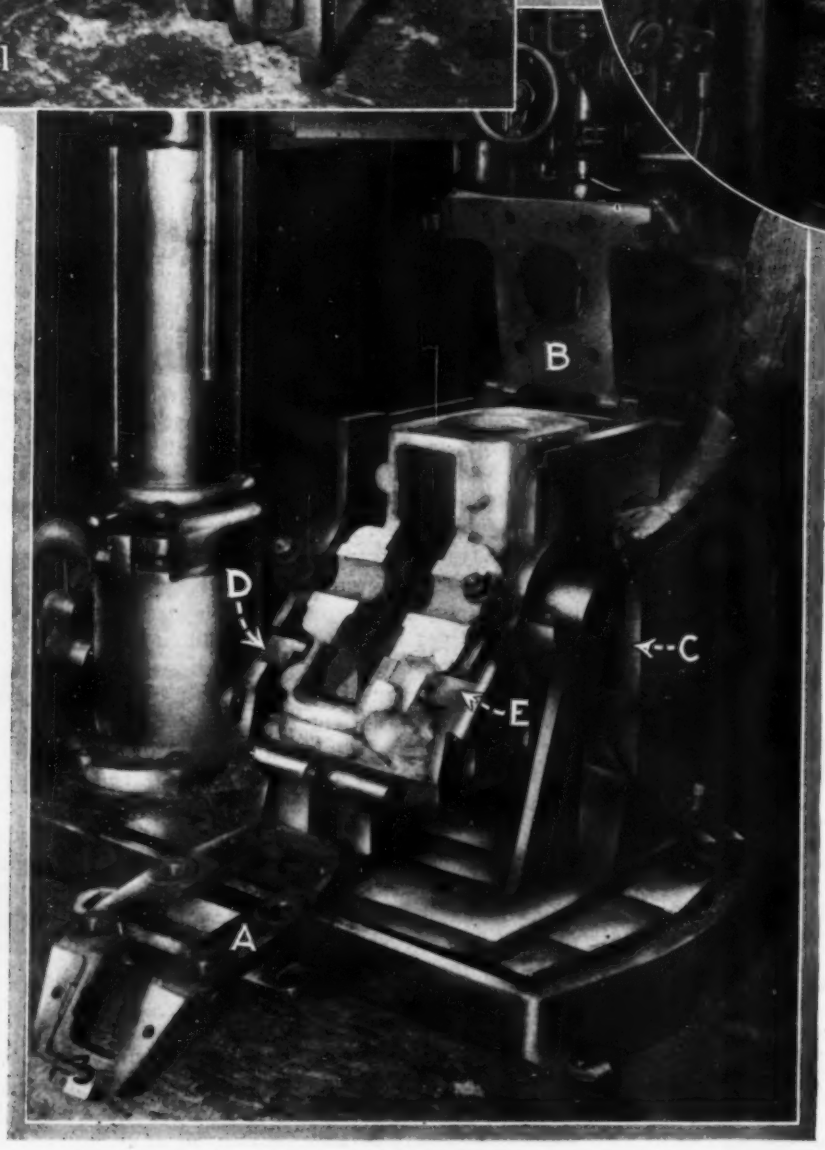


Fig. 1—Laying out casting with templet to insure the cleaning up of the surface to be milled

Fig. 2—First machining operation. Casting held in 3-way, indexing fixture. Both ends and the angular seat for bearing caps are milled at one setting. Casting is held on locating points by hinged strap over top

Fig. 3—Trunnion fixture in which 26 holes are drilled at one setting. Drill bushings in hinged plates *A* and *B*. Index pin controlled by lever *C*. Castings located by blocks *D* and *E*

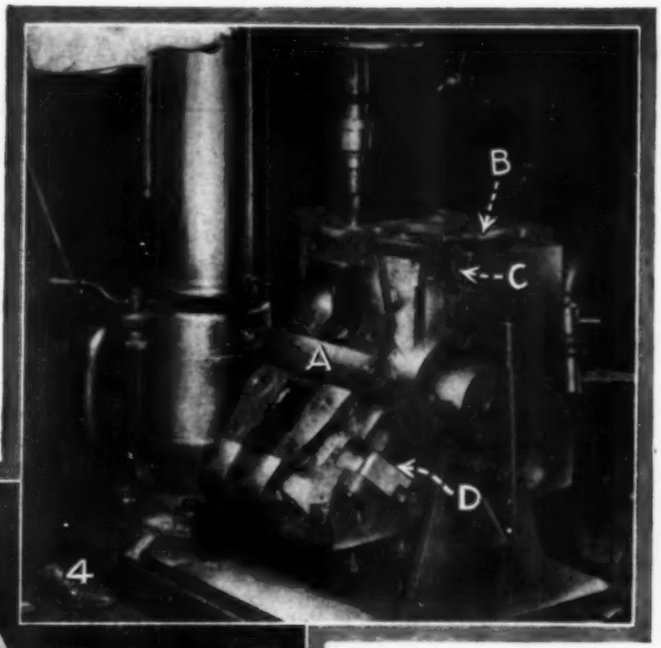


Fig. 4—Bushing plates locked in position, plate *A* by clamp, plate *B* by latches as at *C*. Locating blocks swing out of the way, as at *D*. Holes are also tapped at the same setting

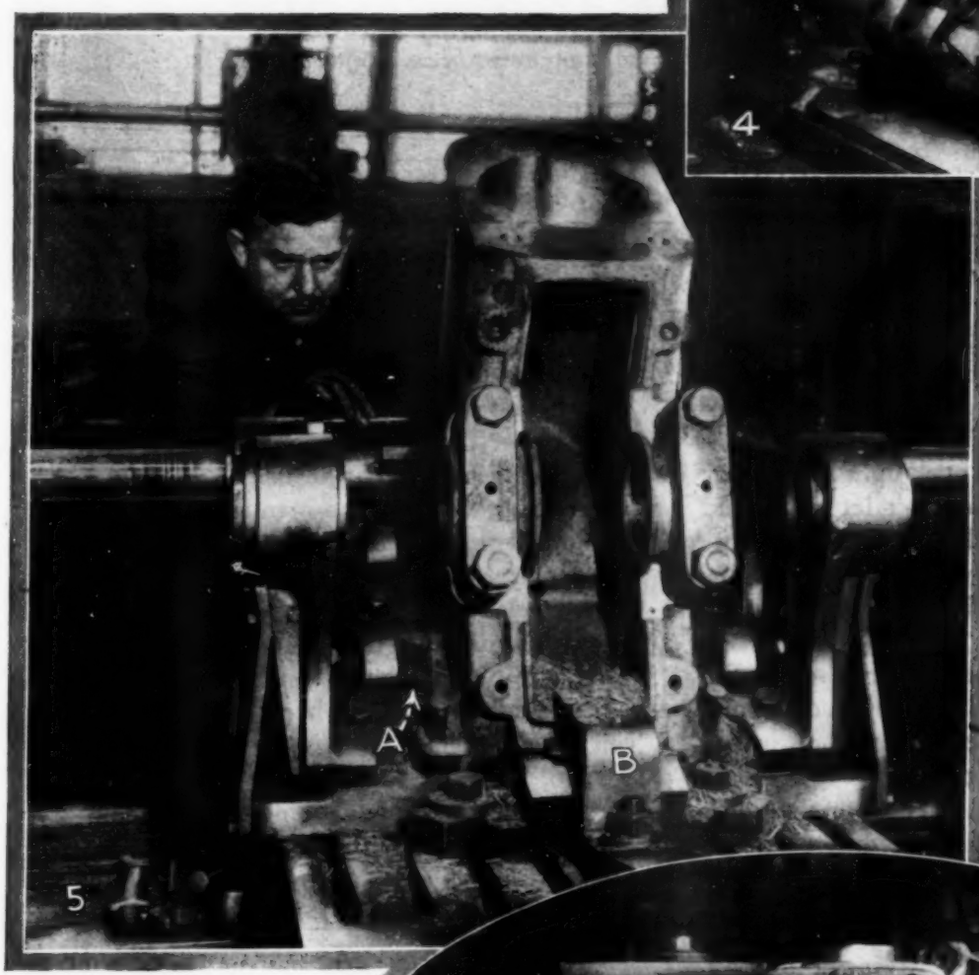


Fig. 5—Boring the bearings and facing boss on one side. Casting located by drilled holes and held by screws as at *A* and clamps as at *B*. Fixture guides boring bars. Measuring face of boss from fixture

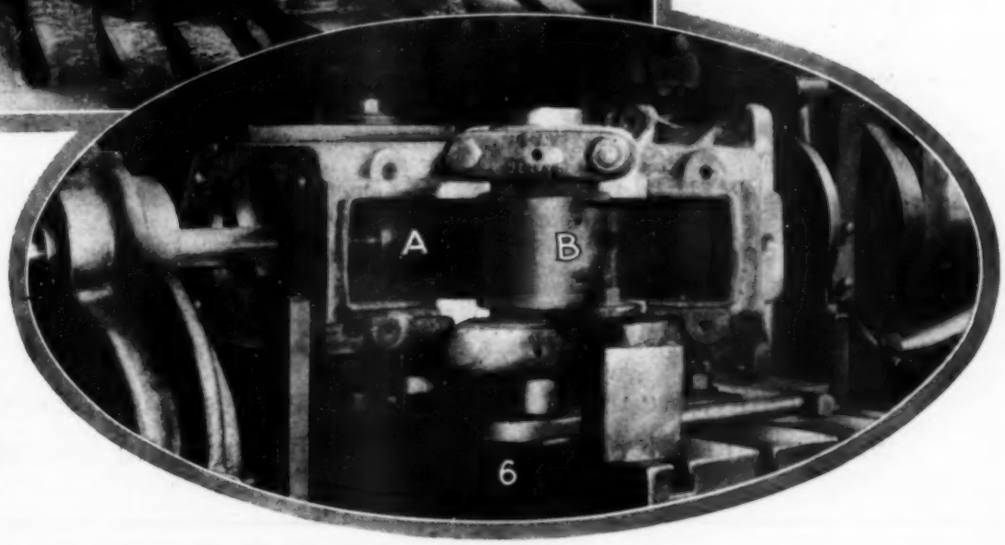


Fig. 6—Boring for shaft. Work held by bearings on vertical mandrel to insure alignment. Finishing hole with a fly cutter. Boring bar guided at *A* by heavy support located on the mandrel *B*

THE · FOREMAN'S · ROUND · TABLE

Posting Too Many Rules

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"SEEN the new set of rules, Al?"

"Yes, Ed, I saw 'em. Looks like a whole sermon plastered on the bulletin board."

"Read 'em, Al?"

"Yes, I did. Thought it was part of my duty as a foreman. But how many of the men will ever stop to read 'em all?"

"I dunno. Still we've got to have rules, you know. I'd like to stick up a few of my own, only Williams wouldn't let me. Said he couldn't help what the office put up on the bulletin board, but he wouldn't have the departments plastered with rules that nobody reads."

"Williams has a lot of horse sense, Ed. I agree with him fully. About the only rules I'd put up would be those giving the working hours, and smoking regulations due to fire hazards. The fewer they are, the more they'll be read and remembered."

"Don't you want the men to look after the tools, and keep the place neat and clean, and not spill water and oil on the floor, and a lot of other things, Al?"

"Sure thing, Ed. But I've never seen men spend a lot of time reading a long list of rules, or remembering them. I believe it's part of the foreman's job to keep order in his department."

"But you've got to have rules, Al!"

"I know it. But you don't have to stick 'em all on a board that no one looks at. A printed rule won't keep a man from flooding the floor with tobacco juice, or from sneezing in your eye. He's got to have sense of his own or else have it shoved into him with strong language. You wouldn't drag a man up to the bulletin board and point out the rule. You'd tell him where he got off, if you didn't hit him first.

"No, I believe that passing out the rules verbally is better than printing most of them. Saves antagonizing the man who behaves himself, and the thoughtless cuss gets it rubbed in so he remembers it more."

Is Ed right about having a long list of printed rules? Or does Al have the right idea? Does a heart to heart talk with the offender impress him more than printed rules?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Receiving Personal Mail in the Shop

AT TIMES it may seem like a waste of time for a man to receive mail in the shop. First, on the part of the man who delivers it, and then on the part of the receiver who must naturally read it at once. If we analyze the situation, however, it may not be so much waste. The prompt delivery of a letter will create a feeling of goodwill on the part of the employee towards the company. He feels that the company is taking an interest in him, and seeing that his personal wants are gratified. He becomes more contented, and spreads the message of goodwill. If an important letter is received at the office and not delivered to him, but left lying around, or in the rack, as happened to Jim Blake, what will the reaction be? The employee will get disgusted, will lose his confidence in the management, get surly, and for a time "lay down" on the job and not give his maximum effort. He will stop and talk to the other men, criticizing the action of the company, thereby wasting much more time, both his own and others, than it would take to deliver and read the letter. If the shop is of any size at all, there would be a regular mailing system, otherwise the office should send the letter to the foreman, and he can deliver it, thereby making closer personal contact between him and the man, and serving as a means of creating a better feeling of confidence and goodwill in the shop.

—P. H. PEARSON.

YES, the men were certainly justified in making their complaint concerning the rack method of mail distribution. In these days when we hear so much about labor and industry getting together and looking after each others interest, does it not seem in this particular case that the management is losing a golden opportunity to prove that this mutual feeling really does exist, and is not mere words? After all, it is the little things that count in a case like this.

As to who should handle the workmen's mail, I can see no harm in the foreman or the personnel department handling it. The most important thing is to see that the letter is delivered to the workman with as little delay as possible, and by this I mean that it should be delivered to him with the next mail delivery if one exists in the concern, and to see that it is delivered to him personally, either by messenger or through the foreman.

Goodwill is better than money saved. To prove this, look at the most prosperous concerns in our country today, and the policies that exist within them. Are these policies not put into effect in order to gain the confidence and goodwill of all employed, both in office and shop, which in turn enable us all to enjoy the better things of life? No concern can work efficiently for any great length of time, if the people working within it feel that they are being oppressed

—S. W. SULLIVAN, *Foreman.*

Solving the Vacation Problem

THE discussion between our friends, Ed and Al, about vacations for the shopmen, is a good one. I believe that there is no better way of creating a sense of loyalty and appreciation among all classes of employees than to make them feel that everyone is getting a square deal. If one class of employee is entitled to a vacation with pay, then all classes of employees should have the same privilege. Vacations for those working on the hourly basis or on piece work might be expensive from the financial standpoint, still I believe those companies that are trying such a plan get a fair return on their investment in greater production, and in a better feeling of loyalty to the company. Tardiness is a costly annoyance, and it would seem that in every department there are some employees who are constantly on the tardy list. These men are not only late themselves, but when they arrive they cause everyone near them to stop work long enough to do the usual "joshing." I believe that the time bonus would help to solve the loss caused by tardiness, and I am sure that if it were given as credit toward a vacation, it would be more effective than "docking." Ed is right when he says that the men in the shop resent the idea of fellow employees who work on the salary basis getting from one to two weeks' vacation with pay, and no loss of time for holidays, while they must lose pay for the usual holidays and get no vacation, unless they choose to take one on their own "hook." I believe that the vacation idea for shop employees will prove successful if carefully tried out.

FRANK A. HYDE, *Timekeeper.*

Receiving the New Man in the Shop

IT WOULD appear that Al had made the greater study of breaking in the new man, and some of his procedure in the case is good, yet I believe some of Ed's ideas should be incorporated in the process. It seems to me that the best way to handle the new man would be a combination of the two methods. The man should be introduced, as proposed by Al, to make him feel at home, and also make the older men understand that he has the qualifications for the position. Next he should be given the fairly hard job that Ed mentions,

THE · NEXT · TOPIC

Making Time-Studies

ADVANCE QUESTION

Ed objects to the time-study man trying to work under cover.

What procedure should the time-study man follow when he makes studies in a department?

but with enough help consistent with that needed by a first-class man, at the same time making him understand that his task is just an average one and that he is expected to complete it with no more help. It sometimes takes several years to overcome a wrong impression given an employee on the first day of employment, and making things too easy for him is one of the worst dangers of this kind. —A. F. ARAND.

MY EXPERIENCE is that many new men are anxious to make a good showing, and frequently spoil work in their eagerness. Others are nervous in a new shop until they settle down, and this state is not conducive to good product. Any new man is working under disadvantages until such time as he has settled down to the shop, become familiar with the various rules, knows what equipment the shop carries, becomes acquainted with the quality of product required, and learns the special methods of doing the work in hand. To eliminate all these disadvantages and prevent spoiled work a new man requires a certain amount of nursing for a few days.

I find the best way to initiate a new comer into the ways and requirements of the shop is to place him under the wing of a carefully selected fellow workman who is executing similar work, and who also has the ability to instruct and the temperament to impart any information required. —A. W. RENMOS.

Insurance and Savings in the Shop

INSURANCE in the shop would help solve the problems of the workmen. It would be beneficial both to employer and employee if the company insured the plant as a unit, the men paying part and the company paying a percentage, depending on the length of service.

Much of a man's work depends upon his ability to think, and a man who is always worried about his family affairs cannot be as valuable to a company as a man who is free-minded. The man who knows his family is protected by the insurance that was made possible by his company will do a great deal more work than the uninsured man who always has something else on his mind besides his work. —M. V. DUMIRE.

Tool Sales in the Shop

MY BELIEF is that a concern should provide means whereby a man may purchase tools through the company, thus gaining the benefit of the company's discount. Private ownership of a set of tools is something that should be encouraged by every company. We all know, through handling tools, that there is a certain "feel" about tools that we are accustomed to handling. With a man who takes up a tool which he is accustomed to handling, there is a pride in its use, and he feels that it is O. K. because it has been with him and been through what he has been through. His pride in it has made him take care of it, and check it to see that it is always right.

There are a few tools that I believe should be carried on hand in the toolroom. These are: A height gage, gage blocks, depth gage, spring tool holders, and threading tools. Along with these, I think that one complete set of measuring tools should be carried in the toolcrib, for there are mechanics who have not a complete set. These, however, should be checked at least twice a week. —C. MANGER.

Abolishing Private "Mikes"

WILLIAMS will find, when he checks up on his company "mikes," that it is the most expensive experiment he has tried for a long time. Company "mikes" are used by everyone, and will be the goat for every mistake after a short time, unless a man is designated to look after them.

A certain toolmaking firm that formerly had company "mikes" has eliminated much of the spoiled work by eliminating this one item. The company "mikes" that were in circulation were all put in first-class shape, and then sold to anyone desiring them at reduced prices. These same tools that were formerly the butt of all spoiled work are now turning out better work in the shop, because the owner is responsible for how they measure. —C. G. WILLIAMS.

Keeping Track of Improvements

THE shop's chief difficulty in getting a hearing on improvements in the product is due to the fact that ordinarily they reach the engineering department in a "half baked" condition. This is because the shop man lacks training in presenting an idea, and that his enthusiasm will run ahead of his investigation, and he will not go into the suggestion thoroughly before presenting it. Thus the germ of a worth-while idea is often lost because on the face of the presentation it is not feasible, and once turned down, it is hard to get attention the second time from the executive end.

So, a follow-up form, providing the means of presenting an idea in a thought-out form, and the means for bringing it to attention, is both logical and practical. Sketching up an idea often brings out the opportunity to overcome difficulties that would not otherwise be apparent, and so prevents the basic idea from being discarded before it has a real chance. And if, perchance, the idea is not good, it will save a lot of time and prestige to find it out before bringing it higher. —FRANK M. TUOHY.

Using Makeshift Tools

WILLIAMS was right in turning down Ed's idea. The makeshift would have taken time to make the necessary alterations. Also, it would take material. The cost of this would go a long way towards the purchase of the new miller. The altered drill press could only be used for that particular job, whereas if a new miller were obtained, it could be used as a production machine when the job is finished.

It is correct to use a makeshift method in an emergency with no other method available, especially if a production machine for it would be useless for other work afterwards, or if there were a lack of funds. In regard to the motor car, it does not seem as if a man who is content to ride in an old, out-of-date vehicle would be inclined to spend much on shop equipment if he were boss. —W. E. WARNER, *England*.

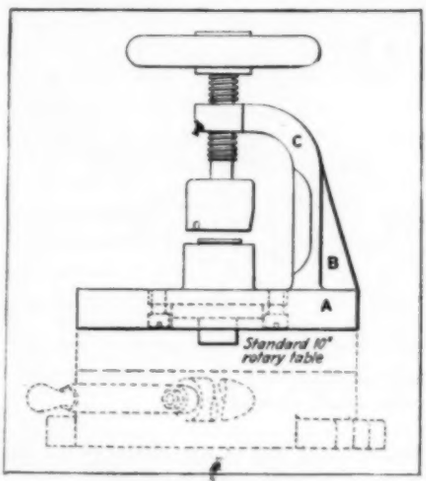
Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Welded-Steel vs. Cast-Iron Jigs and Fixtures

By Wm. C. Landis

Several articles have been published in the *American Machinist* regarding the advantages to be had from the use of welded steel shapes, instead of castings, in the fabrication of jigs and fixtures. There seems to be a consensus of opinion, and our experience has not been to the contrary, that fabrication by welding has the following advantages: Increased strength; reduced weight and space; quicker fabrication; and reduced cost. In almost any jig or fixture that might be contemplated, at least one of these factors is of prime importance. Within the last month we had occasion to redesign a fixture used for milling the lips of air-brake hose couplings, and turned to the welded steel construction because it was the easiest way to obtain the required structural rigidity, and because it was imperative that it be available for use as quickly as possible. We were not disappointed.



Fixture fabricated by welding

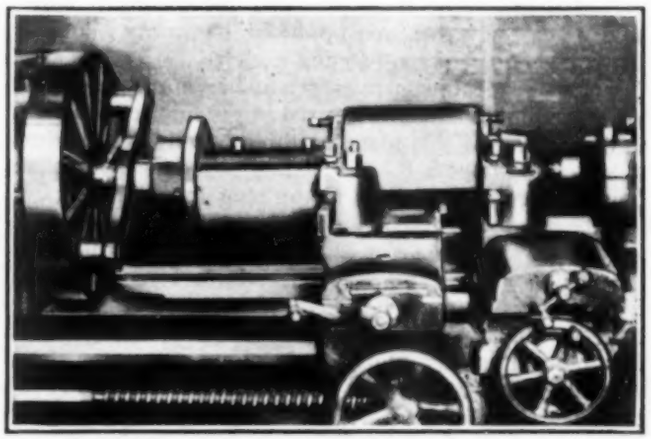
The sketch illustrates this fixture. The circular plate *A* and the bracing web *B* were burned with a torch from commercial plate, and the goose-neck *C* was cut and bent from standard bar stock. The three parts were welded together and machined by ordinary processes.

Mandrel for Holding Crown Brasses

By W. F. Stewart

In turning the outsides of crown brasses in the lathe, but one piece can be held on the usual type of mandrel. Due to the position of the brass an unbalanced condition is set up, making it advisable to put counterbalance weights on the faceplate.

In the mandrel illustrated, provision has been made for holding two brasses, so mounted that they are practically in static balance. The construction of the mandrel



Mandrel for holding two crown brasses

is no different in principle from that of the usual type, the only difference being that the tight collar is in the center instead of at the end, and that two loose collars are provided instead of one. Of course, the mandrel is longer.

With this method of mounting, the brasses can be rotated at higher speed than if the mandrel held a single brass without the use of counterweights on the faceplate. If the lathe is equipped with two carriages, both brasses can be turned in the same time taken to turn one on a mandrel holding a single brass.

Dimensioning Drawings—*Discussion*

By John F. Hardecker

In an article on page 442, Vol. 67, of the *American Machinist*, Frank C. Hudson questions whether there are any valid objections to the system he proposes which gives both the high and low limits, i.e., $\frac{4.2495}{4.2500}$ or $\frac{3.000}{3.002}$ inches.

This system would require the mechanic to remember a possible maximum of ten significant figures (eight in the second illustration) to function as intended. What will obviously happen, due both to long training and convenience, is that the mechanic will select the easier of the two figures to remember, subtract the difference between the two and remember that. He will not attempt to remember both figures as given. The practical effect of this is that he will have the unilateral system $\left(3.000 \quad \frac{+0.002}{-0.000}\right)$ without having the opportunity of designating the desirable figure for the man to aim at.

I think this "mental hazard" will overcome the apparent good in this system as it appears on the drawing.

A minor objection to such a system may be the occasional difficulty in summing up inside dimensions to obtain an overall dimension, with the possibility of confusion in determining which of the two figures in each instance is the nominal, or whether the nominal lies somewhere between them.

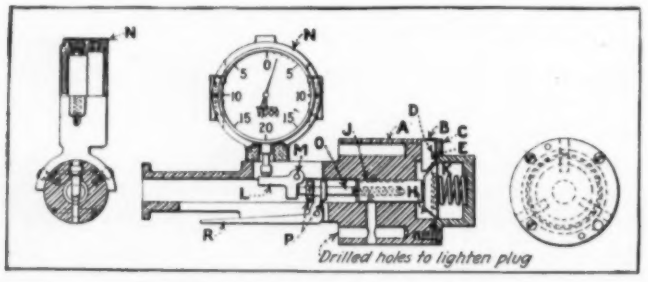
A Dial Gage for Internal Measurement

By B. J. Stern

A dial indicating gage intended for gaging a bored hole in castings that are produced in quantity lots, is illustrated in the accompanying sketch.

The body of the gage is ground on its plug end *A* to the minimum diameter desired in the finished hole. On the front end of this plug are three equally spaced slots in which the fingers *B* are a sliding fit. The cover plate *C* is screwed and doweled to the plug face, thus enclosing the three fingers in their slots. Each of the three gage fingers *B* has a slot *D* at the bottom, in which lies the round wire spring *E* that tends to force back the fingers, keeping their tapered ends in contact with the corresponding ground taper face *H* of the plunger *A*. The plunger is kept from turning by a pin in the plug, which slides in a groove in the plunger. The spring *K*, contained in the cover, forces the plunger up, keeping it in contact with the bell crank *L*, contained in the handle end of the gage. The bell crank pivots on the pin *M* and is kept pressed against the end of the spindle of the dial indicator. The indicator is contained in a two-part aluminum casting, the bottom part of which fits the periphery of the handle, while the cap *N* fits over the indicator, clamping it in place. The cap also contains a screw that limits the upward travel of the indicator spindle, thus keeping its travel, and consequently the movements of the other parts of the gage, within definite limits.

The shaft *O*, screwed into the plunger *J*, is adjustable, being reached through a slot in the handle. A set-



Dial gage for internal measurement

screw clamps the shaft after adjustment, being reached through a hole in the plug *A*. The shaft has two shoulders at *P* between which fits the head of the bell crank *R*.

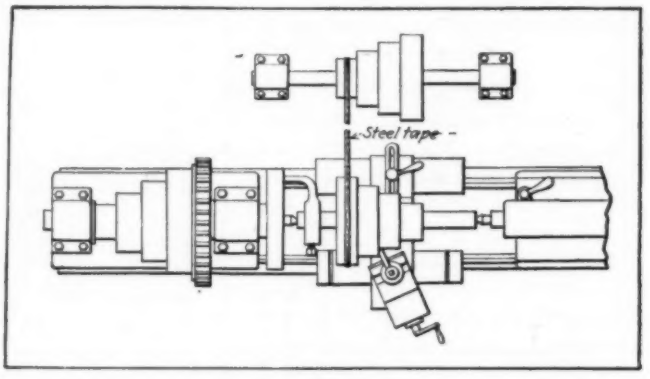
In operation, the gage being grasped by its handle, the hand of the operator forces the short end of the bell crank *R* against one of the shoulders *P* on the plunger, thus forcing it back against the action of spring *K*. This action allows spring *E* to bring back the fingers *B* below of the surface of the plug. The plug end of the gage is placed into the bored hole, which is in a vertical position, and is lowered to the bottom, if admitted. Of course, if the hole is too small to take the plug, then the part is at once rejected. However, when the plug reaches bottom, the bell crank *R* is released, allowing the spring *K* to press against the plunger *J*, overcoming spring *E*, and thus forcing the fingers out until they strike the wall of the hole, registering its size on the face of the dial. The angle of the taper on the plunger is 45 deg., giving a one to one movement, while the bell crank gives a two to one movement, so that a movement of 0.001 in. on the part of the fingers will give a movement of 0.002 in. on the face of the dial. Moving the gage up and down and turning it around occasionally, gives a direct reading of the size at any desired location of the hole and also shows the out of round condition at any particular point.

Turning Cone Pulleys

By G. A. Holt

Councilman N. E. Division, International Correspondence School

Some time ago we were confronted by the problem of turning a pair of four-step cone pulleys, so that the belt would be in even tension on all of the steps. The



Turning cone pulleys so that the belt tension would be the same on all mating steps

speed ratios of the pulleys and the center distance of the shafts to which they were attached were known.

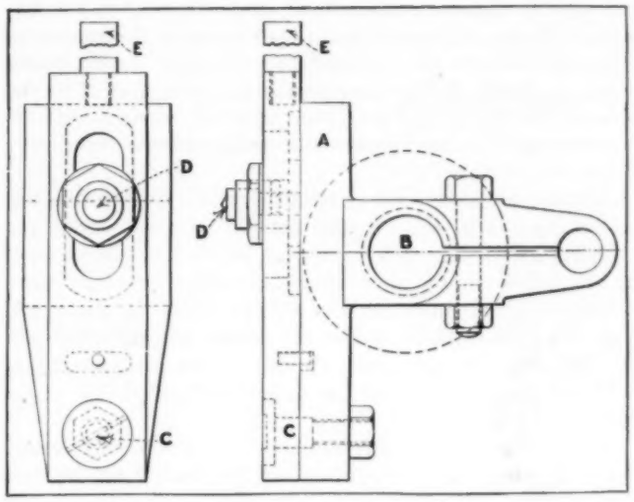
Instead of using formulas or graphic methods we proceeded as follows: One cone pulley was finished all over and was attached to a shaft mounted behind the lathe at the correct center distance. The other pulley was mounted in the lathe and all the steps were rough turned to within $\frac{1}{4}$ in. of the diameters required to give the proper speed ratios.

One step was then finished and a steel tape was passed around it and the mating step of the other pulley, as the belt would run. The measurement was carefully taken and the remaining steps were turned until the tape reading was the same on all the steps. The sketch shows the method of procedure.

Dressing Grinding a Wheel to an Arc of Long Radius

By Frank C. Hudson

One of the operations on the outside of a sleeve for the Knight engine, is the grinding of a relief in the shape of an arc of long radius. In order to secure the desired curve, a long radius-rod would have been necessary on the wheel-truing device, and since this would have been very inconvenient to use on the grinding machine another method was adopted.



Compact device for producing convex face on a grinding wheel

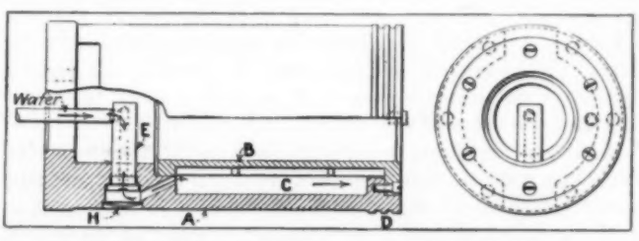
The truing device consists of the body *A*, having a projection at the back that is clamped on the dead-center spindle of the grinding machine at *B*. On the face of *A* is an arm that swings on the pivot *C* and carries a diamond at *D*. The diamond can be adjusted in the slot, as shown in the front view, so as to be either on the center line or as much above it as is necessary to secure the desired arc on the face of the grinding wheel. With the device clamped on the spindle at *B*, and so positioned that the diamond is above the center of the grinding wheel when the movable lever is in a central position, any movement of the lever *E* sweeps the diamond across the face of the grinding wheel and produces a convex surface, the radius decreasing as the diamond is set farther away from the center.

While this movement will not give a perfectly true arc, it is sufficiently accurate for its purpose and would probably answer in the great majoritiy of cases. With the diamond *D* set at the center of the grinding wheel spindle, its movement across the face of the wheel will produce an approximately straight face. The narrower the wheel the more nearly straight this surface will be. The device was designed, built, and is in use in the shops of the Yellow Sleeve Valve Engine Company, East Moline, Illinois.

Water-Cooled Chuck for Grinding

By Clifford H. French

In order to prevent distortion from unequal temperature, the Yellow Sleeve-Valve Engine Co., Moline, Ill., has adopted water-cooled chucks for use in grinding the sleeves used in its Knight engines. These chucks are made for different grinders, a sectional view of one of the chucks being shown herewith.



Water-cooled chuck for grinding sleeve-valves

The chuck consists essentially of the body *A* and the inner sleeve *B*, being so designed as to form a substantial water space between them, as shown at *C*. The outer end of the body runs in a special steadyrest, at *D*, so as to prevent sag and its accompanying effect on the straightness of the hole being ground.

Water enters the chuck through a central pipe projecting through the hollow spindle of the machine. The outer end of this connecting pipe runs in a water-tight joint. The inlet pipe is screwed into the short upright or cross pipe *E* at a point central with the axis of the grinding spindle. This is an important point, and perhaps the most particular feature in connection with the construction of the chuck. The cross-connecting pipe *E* enters the body of the chuck through an opening in the side. The outer end of the opening is closed by a Welch plug, at *H*, such as is used in closing bored openings in automobile cylinder castings and similar places.

The arrows show the direction of the water as it flows from the inlet pipe and around the outside of the shell that carries the sleeve being ground. There is also a small outlet, not shown, through which water escapes from the jacket, and after being strained it is returned to the water in the cooling system.

The cooling water is contained in a tank placed at a sufficient height to give it a fair velocity as it flows through the chuck. The water is heated to a temperature of 180 deg. F. by means of steam coils in the distributing tank, and in this way a very even temperature is maintained in the work being ground. The introduction of this system has proved so satisfactory that it has been extended to include much of the grinding on other work of a like character.

Finish Boring a Tractor Crankcase

By Henry C. Francis

The illustrations show two views of the way a heavy tractor crankcase is finish bored in the plant of the Caterpillar Tractor Co., Peoria, Ill. After all the other

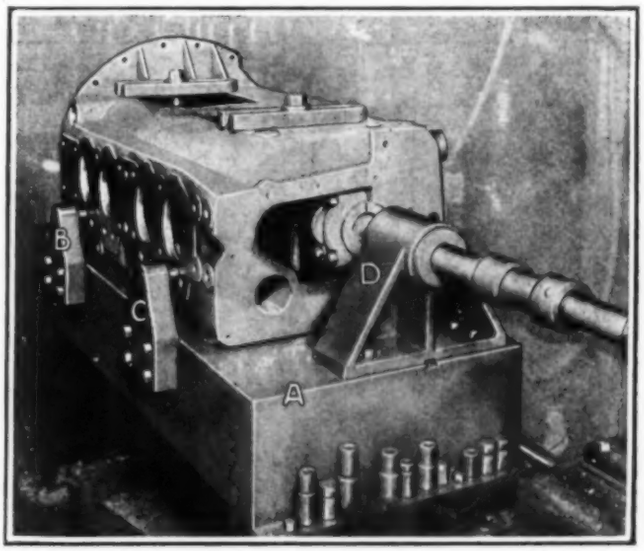


Fig. 1—Crankcase located in finish-boring fixture

machining operations have been completed, the crankcase is mounted on the heavy table *A* and its upper surface, that receives the cylinder block, is positioned against the two substantial stops *B* and *C*. This insures the

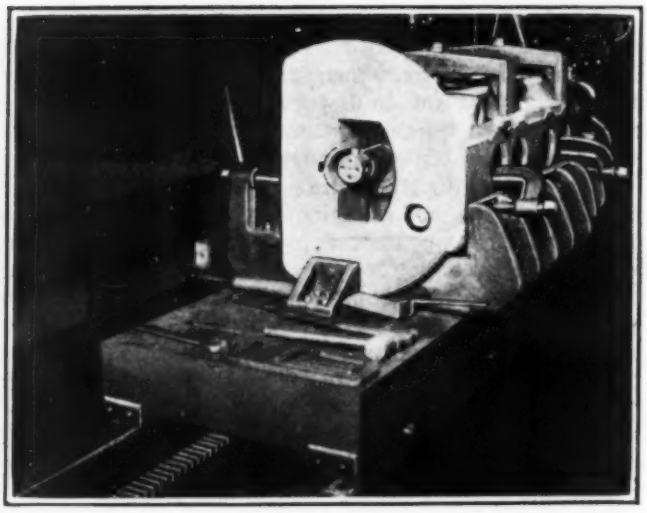


Fig. 2—Other end of fixture showing cutter at work in a half bearing

alignment of the crankshaft bearing and also the distance from the cylinder face to the crankshaft.

The boring bar is driven through flexible couplings and is supported in substantial bearings at several points. The first support is outside the crankcase, as at *D* in Fig. 1, while Fig. 2 shows the back of the rear support. These supports enter the crankcase between the cross-ribs or partitions that support the bearings. Each of the bearings for the boring bar has a slot cut in the upper side, so that the single fly cutter used in the finishing cut, will pass through the bearing, and yet be supported close to the cut.

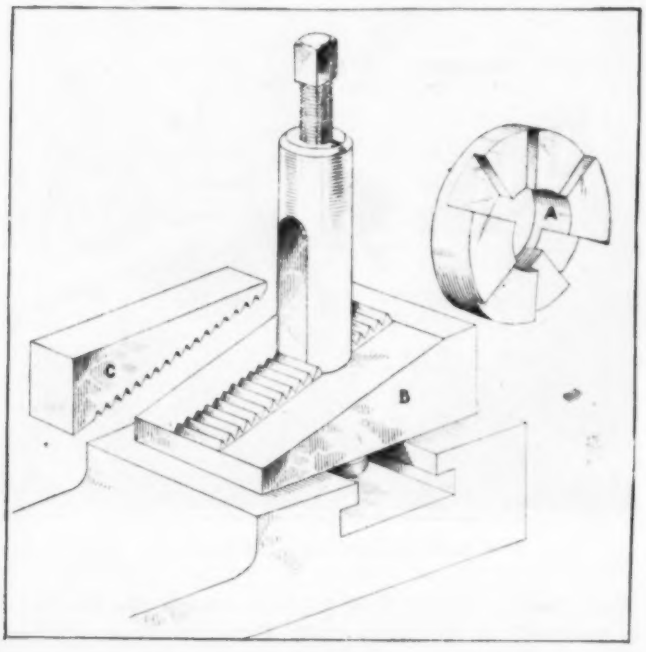
Another Method of Tool Adjustment

By Foster B. Elliott

The height of the tool point in relation to the axis of the work to be turned is an important factor in all lathe work, and there are many devices available that are intended to facilitate adjustment in this respect in accordance with the judgment and experience of the operator. Among them are the rise-and-fall carriage, the elevating screw toolpost, the circular step-block shown at *A* in the accompanying sketch, and the concaved washer with its corresponding round-bottomed wedge-piece, commonly called the "cradle."

The sketch also shows another method that, while not so common, is giving us good service. In this device the toolpost passes through the wedge-block *B* and is secured to the toolblock by an enlarged shoulder or loose plate fitting in the transverse slot of the block in the usual manner. A toothed wedge *C* passes through the slot in the toolpost, the teeth on its under side engaging with similar teeth cut on the upper surface of the wedge block.

With this device, adjustment is quickly and easily made by entering or withdrawing the wedge as the case may require, and there is no tendency for the tool to slip under pressure of the screw or of the cut while in service.



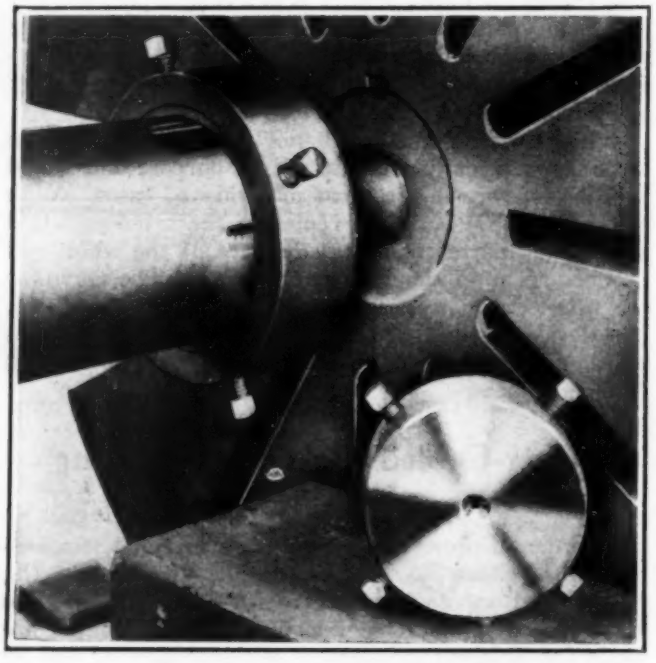
Wedge-block and wedge for toolpost

Turning Shafts That Are Not Centered

By I. B. Rich

Turning old or new shafts from which the centers have been removed, is more or less of a task in most cases. The use of a cap-center, as shown herewith, makes the job much easier in every way.

The cap has the center very carefully located as to concentricity with the bore that goes over the shaft.

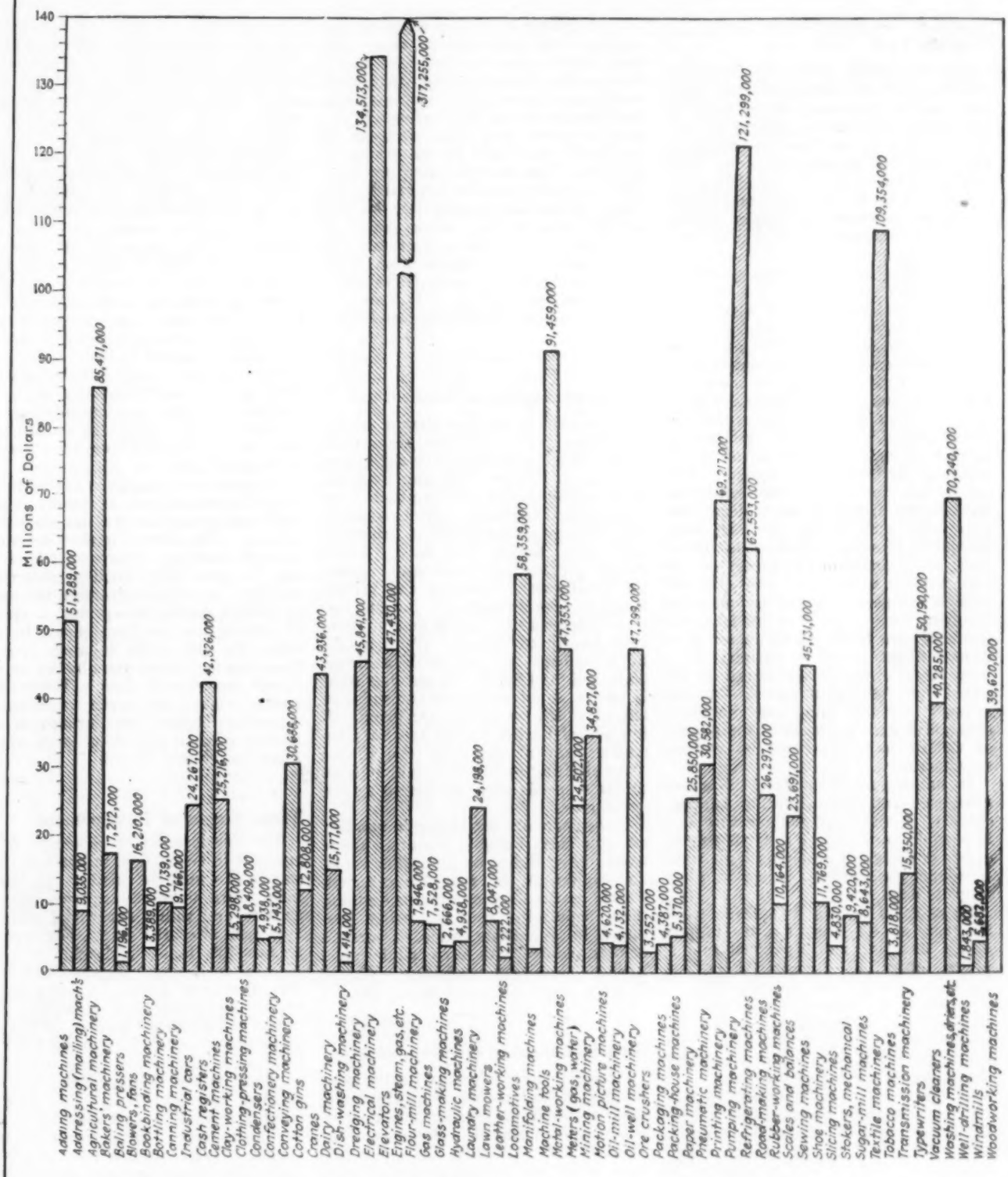


Cap for turning shafts without centers

Instead of having the setscrews bearing directly on the shaft, a split bushing is used inside as shown. By having bushings of various sizes it is an easy matter to center the cap on the shaft so that it will run true.

It is not necessary to use the bushing on rough shafts. The cap can be screwed directly to the shaft and the shaft trued by putting it in the lathe and indicating it as it is revolved slowly. Adjustment is easy by means of the four setscrews.

Machinery Production in 1925



The chart is based on figures recently published by the United States Bureau of the Census, and gives the money valuation of the machinery manufactured in the United States during the year 1925. While the figures are now nearly two years old, they still give the relative comparison between the principle classes of machinery. The figures include only complete machines, except in a few cases.

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Technical Abstracts

Technical Questions in the Light of the Law

The litigations arising in industrial relations between individuals and firms are steadily becoming more involved and technical in nature. Often no provisions exist in the law for situations that arise, but nevertheless some legal and just solution must be found in every instance. Life does not wait, and judges are often compelled to make rulings based on interpretations of the lawmaker's intentions, and to adjust themselves to the changed business conditions and requirements.

Among the new concepts with which the courts have now to contend in many technical cases, the following three might be mentioned: The meaning of errors in design, fatigue of materials, and of safe working conditions. Many contracts contain the provision that the manufactured article is guaranteed against defects of material, of workmanship, or errors in design. The design has to do not only with the form of the article in every detail, but also with such things as tolerances, allowable stresses, selection of materials, and manufacturing processes. It goes without saying that only qualified experts can pass judgment on questions involving such an array of fine technical points as are likely to be raised in a dispute about errors in design. In a very large measure the design is affected by the manufacturer. As an example we may point out the great differences existing between the quality of welded joints executed by various manufacturers.

In judging a design all of the above mentioned conditions have to be considered "in toto," and without this it is impossible to pronounce it as possessing errors of design or absolving it as being free from such errors, except in cases of gross negligence.

In cases of fractured machine parts the cause is often sought in the fatigue of the material, and attributed to improper operating conditions. If this point is granted the manufacturer is absolved of any responsibility. But the true situation is in reality a very complicated one, and the stress under which the fracture will occur is not a constant depending on the material alone.

In designing it is important to take into consideration the probable life of the article, and to choose the material with a view to its fatigue under normal conditions. Only if due precautions of such a nature have been taken by the manufacturer can the blame be justly put on the shoulders of the buyer, and attributed to improper operating conditions.

It is also apparent that the meaning of safe working conditions is not such a simple matter as is often unjudiciously considered by non-technical men. We have already seen the influence of fatigue on the allowable stress, then there are the questions of stress concentrations due, broadly speaking, to effects of design, as proved by an analysis based on the complicated laws of the theory of elasticity. The manufacturing processes all leave their mark on the article, and unless taken into account step by step a truly safe working stress under all conditions cannot be arrived at. In many cases the recommendation for a safe working stress has to be based on experience and analogy. — R. Baumann and A. Suskind, *Zeitschrift des V.D.I.*, Sept. 10.

American Engines in French Cars

There was a marked change in the cars shown at the 1927 Paris Automobile Salon, which included every car manufacturer in France, Italy and Belgium, 23 American makes and two each from England and Germany. Prices of small cars are now below those of American cars after paying the duty. Three French cars are using American engines, the Continental, Lycoming and Willys-Knight. One French car, Lavaud, has a one-piece chassis, cast in an aluminum alloy known as "alpax." With a 128-in. wheelbase the car, with a closed body, weighs 1,800 lb. It also has what is known as an automatic transmission but of which no details are given. A low-priced Berliet has an auxiliary reducing gear at the front end of the drive shafting giving two combinations of three speeds each, similar to a two-speed axle.

Closed cars are increasing in number, straight sides being a feature. Some sedans have sliding or collapsible roofs, and trunks at the rear are common. Fabric leather bodies are maintaining their popularity and are being produced in a cheaper scale of smooth leather, painted with nitro-cellulose and having aluminum moldings.—W. F. Bradley, *Automotive Industries*, Oct. 15.

Electric Annealing of Alloy Steels

A special electric furnace for the heat-treating of high-carbon, high-chromium steel required in bearing manufacture was recently installed in the plant of the Timken Roller Bearing Co. The furnace is for use in annealing steel bars, tubing and wire. It is rated at 850 kw. and has a capacity for annealing 80 tons of bars at one charge.

In the annealing of this class of steel, it is important to maintain a furnace atmosphere that will not decarburize the surface of the steel, thus making it necessary to use an additional machining operation to remove the soft outer layer. The use of a pit type of furnace was decided upon because of the ease with which infiltration of air can be prevented. The furnace has an inside width of 9 ft. and a length of 21 ft. and a depth of 6 ft. 6 in. It uses cast T-grid type resistance units of nickel-chromium alloy. The furnace has a double sand seal at the top of the wall, which forms the parting line between the cover and furnace. The cover of the furnace weighs more than 25 tons and it has a firebrick arch. A special gantry-type traveling crane was built to handle this cover. The crane runs on rails at floor level and is arranged to serve five or six furnaces located in line.

Firebrick piers with nickel-chromium alloy caps are used to hold the charge in the furnace. The heating elements are located beneath the charge and on both sides and end walls. They are protected with guard rails.

In operation a charge is heated to the annealing temperature as rapidly as possible and soaked for the desired period of time. The charge is then permitted to cool slowly to approximately 1,200 deg. F., after which cooling takes place rapidly. In order to increase the speed of cooling during this period, a system of return-flow cooling pipes located along the side walls is used. Air is blown through these pipes by two motor-driven centrifugal fans. While this cooling makes the power consumption somewhat higher, the furnace is extremely efficient due to its large size.—*Electrical World*, Oct. 8.

Three Stages of Development

The development of Scientific Management in Great Britain has had three stages, of which the third is just beginning. First there was a period of great activity and rather superficial enthusiasm just after the war. For various reasons this failed to develop into any national institution. It was checked by the subsequent depression. But its influence continued in a somewhat individual and dispersed fashion. While few employers avowedly introduced the Taylor system as a whole, many continued to study it and to introduce important features here and there. The development of research by scientific bodies into various aspects of management was continued. Today, for the first time since 1921, the disappointment and psychological malaise that resulted from the failure of the high hopes maintained after the Armistice have lifted. A new generation is coming forward and is prepared for constructive work. Books bearing on Scientific Management questions are again being published and

read. Labor opposition is lessening. The large number of scattered individuals who are interested in the subject are beginning to come together again. There is a feeling in the air that the time is ripe for a further forward step. It is likely that within a short period Great Britain will have co-ordinated the large amount of work which has been done during the years of acute depression and will have established national machinery for furthering the course of rationalization. This alone is necessary to enable her to take her part in the great growth of the movement and to participate fully in that international activity which is one of its most hopeful features.—L. Urwick, *The Management Review*, October.

The Light Metal Beryllium or Glucinium

With the ever increasing velocities of our modern airplane motors the use of light and strong alloys is indicated, and metallurgical research is making noticeable progress in this direction. At present most of the alloys used in that respect derive from aluminum having a density of 2.58. Magnesium with its density of 1.6 also enters to a certain extent, but both of these metals have a relatively low modulus of elasticity, namely, about ten million pounds per sq. in. for aluminum and six million for magnesium, while steel, with a density of 7.8, has a modulus of elasticity of about thirty million.

A metal known as beryllium or glucinium, much lighter than aluminum and only a little heavier than magnesium, having a density of 1.84, has at the same time a modulus of elasticity of forty million, or one third higher than steel. Its use in light alloys seems to be very promising and processes of obtaining beryllium economically in sufficient quantities for industrial use are now eagerly sought in metallurgical laboratories the world over. At present its cost of extraction is still very high and a pound of beryllium costs about $5,000, but recent improvements realized give promise of reducing this figure to about $200 in the near future.

The mineral from which this light metal is extracted is known as beryl. It contains 67 per cent of silica, 19 per cent of alumina and 14 per cent of beryllium oxide.

The metal is crystalline in aspect, brittle, hard, of a grayish steel color and can take a beautiful polish. Exposed to atmospheric conditions or to hot water it oxidizes slightly superficially and the film so formed protects the metal from further oxidation. It is only slightly attacked at ordinary temperatures by alkalies and acids. Its Brinell hardness is 140.

Aluminum containing 5 per cent of beryllium has a higher melting point and a lower density than pure aluminum, a higher modulus of elasticity and a greater machinability. The process above described is that recently patented in Germany by Stock and Goldschmidt. —*Revue Industrielle*, June.

Shall We Scrap Our Machines And Go Back to the Spinning Wheel?

The social mystics of the Orient believe that we must smash our machines and revert to handicraft in order to save our souls. They are convinced that machine civilization must mean unhealthy congestion in industrial centers; a narcotic monotony of factory routine that turns masters of tools into slaves of machines; a mass production that puts quantity above quality; a subtle conspiracy against beauty that will end by making ugliness and utility interchangeable terms. This Oriental view is gaining converts in the West.

One of the most prominent exponents of the opposite Western opinion was the late Walter Rathenau, prominent German industrialist. He understood the dangers of the machine civilization as well as the Orientals but saw what they do not see, the promise of it.

The masses have more to hope from the great engineers, inventors and captains of industry than from the social reformers and their panaceas. The shortcomings of the machine, inseparable from the pioneer stage, are curable from the inside. Technical progress in the extension of superpower will eventually decentralize industry and make it possible to manufacture at convenient points and assemble at the market place. This will mean a drastic readjustment of the freight rate structure. It may also mean the solution of the farm problem as chemistry finds the way to make the raw materials of industry from farm products.

Standardized production does deaden creative artistry but such artists are exceptions and will find other outlets for their ability. On the other hand it has given mediocrity its first opportunity to make a decent living.

Beauty is being sought by manufacturers and some of our best art is coming from the designing departments of builders of automobiles, bathroom fixtures and radio sets.—Glenn Frank, *The Magazine of Business*, October.

Group Insurance and Sick Benefits Reduce Labor Turnover

The experienced employee is more valuable than the untrained man, and current industrial conditions make it advisable that consideration be given every practical means to attract competent men, and to induce them to remain in the service.

Aside from the question of obligation on the part of the employer, the practice of aiding the disabled employee has proven itself to be sound business policy. Knowledge that long years of service will not go unrecognized by his company makes him a more contented, and, consequently, a more dependable employee. The two most important phases of welfare work are group insurance and the provision of sick benefits. Group insurance is life insurance for employees, written under a policy issued to the employer for the benefit of persons other than himself. It is paid for by the employer, or by the employer and the employees jointly, and in some cases entirely by the employees. A group insurance policy may not be issued to insure less than 50 employees, and when the premium is to be paid jointly, it is required that at least 75 per cent of the employees be insured.

Every man is faced by the prospect of sickness, accident, and death. If he has no great fortune, there is the further anxiety of permanent disability, unemployment, old age, and the incapacity to work. Some of this anxiety has been relieved by the co-operation of many companies with their employees by establishing this inexpensive form of insurance, which began with life insurance only, but soon broadened out to include sickness and accidents.

A recent survey showed that of 161 electric railway companies carrying group insurance, 78 pay the entire cost, and many make provision for the employee to take out additional insurance at his own expense with low cost. A total of 78 companies handle insurance jointly with the employee, while only 5 companies are definitely known where the employee pays the entire cost.

Closely related to group insurance is the provision for sick benefits. Sometimes these two overlap or are combined, but the sick benefits are usually furnished in addition to, instead of in conjunction with, group insurance. Sick benefit organizations are usually supported by dues levied upon the members, and in many cases by contributions from the company. The expense to members varies from 25c. to $1.75 per month, with the majority of companies reporting dues of $1 per month. The sick benefits paid vary with the rate of wages, and are also paid on a sliding scale, dependent upon the duration of the illness or period of disability.—E. M. Cooke, *Aera*, October.

Cause and Effect of Stresses in Castings

In many cases stresses are set up in a casting as the result of the difference of temperature in its various parts at the instant that the part which solidifies last assumes its permanent form. In a beam having its lower flange heavier and thicker than the upper flange the lower flange will remain in a fluid state after the upper flange has solidified. When the lower flange has become completely solidified the upper flange will have dropped to a considerably lower temperature, and in the subsequent cooling the lower flange will shrink more than the upper one because of this difference in temperature.

A lathe bed, for example, is usually molded upside down because the ways are heavier in section than the bottom flange. The heavy section at the bottom of the mold cools more slowly, with the result that the Vs are the last part to solidify. Thus, when the lathe bed is taken from the mold and placed on a level surface it will be found that the ends are bowed upward.—Forrest E. Cardullo, *Machinery*, October.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Output per Capita Is Key to Progress

HIGH wages and prosperity have gone hand in hand in this country for a number of years. But neither high nor low wages, of themselves, are an index of production costs.

The reason for prosperity has been the low unit costs made possible by newer and better machinery, and the co-operation of worker and management in making that machinery increase the production per capita to an unbelievable extent. High wages and low unit costs have given us much wider home markets for things that were formerly considered luxuries and so have made possible larger production and lower costs.

Take the steel business as an example and note the increases in production per man of from 66 to 706 per cent, during the period from 1902 to 1926. These increases have made possible the better wages and improved working conditions in the industry. And, while such large gains in output per capita are not to be expected in all industries, it is a fundamental of true prosperity that actual production and distribution costs be reduced. Organizations of either employers or employees that ignore this principle are doomed to failure in the long run.

Inspecting Rough Material

INSPECTING of rough material, such as castings and forgings, seems to be growing in favor. The methods vary but there is apparently an increase in the use of fixtures and templets. These devices show quickly whether or not the piece has metal enough, and in the right place, to clean up in machining. Shifting cores and worn dies account for most of the defects as to size. Surface or internal defects are not, of course, inspected by fixtures. In some cases the foundry and forge shop are supplied with these fixtures, a second set being kept in the shop. In other instances all the inspection is done at the shop.

The reasons given for this inspection are not uniform. Some dwell on the saving in labor due to working on defective material. A greater saving, however, comes from not tying up high priced equipment on work that cannot be used, and in eliminating the delay caused by an insufficient number of usable finished pieces reaching the assembly department. The saving in machine time, which includes the machine overhead, is frequently more important than many realize.

More Metric Legislation

IT HAS been announced through the daily press that Senator Gillette of Massachusetts and Representative Britten of Illinois will introduce bills into the next Congress similar in intent to the metric bills that failed in the last Congress. The purpose of the legislation is to force the use of the metric system on the commerce and industry of the United States. According to the newspaper reports the pill is to be sugar-coated by setting up new standards such as a world yard and world pound which would contain round numbers of smaller metric units of length and weight, respectively. But the effect would be exactly the same as that possible from any of the other compulsory metric legislation that has been introduced during the last few years—confusion. We would then have three possible units of measurement and the third one would be about as useful as Esperanto, and as likely of acceptance.

Prosperity or Depression?

SO MUCH has been said about the extended period of prosperity with which America has been favored that it is a good deal of a shock to have a famous economist say that business during the last six months has been going through a depression. If he is correct in his belief and if the rather moderate decrease in activity is to constitute the depression period of the typical business cycle of the future then we shall have much to be thankful for.

Apparently we are not to have extensive periodic unemployment. Conversely, we are not likely to have boom periods when labor scarcity forces employers to bid against each other for men. Stabilization of employment will remove the greatest worry from the mind of the wage earner and reduction of labor turnover will greatly simplify the problem of the employer.

The salaried man is likely to fare at least as well as he has in the past by reason of the smooth turning of the wheels of industry. Only the proprietor will have increased difficulties as the profit margin is gradually squeezed down. He will have to substitute careful planning and hard work for stimulating if sometimes risky speculation.

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Libby Type H Heavy-Duty Turret Lathe

TWO sizes of the "Libby" Type H heavy-duty turret lathe, 29- and 32-in. capacity, respectively, were recently designed by the International Machine Tool Co., Indianapolis, Ind. Many improvements have been incorporated in these machines over former models.

Considerable care was taken to design the bed pattern so that close-grained iron in the ways is assured. The bed and headstock housings are cast in one piece for accuracy and rigidity. The entire unit is of box form with two longitudinal ribs running the whole length of the bed and headstock housing, and with cross-ribs every foot. The depth of the bed from top of ways down is 22 in. These beds are rough planed and rough bored, then seasoned from two to three months before they are finished in order to eliminate warpage. The oil pan, the legs, and the turret reservoir are also cast integral with the bed.

The gearing in the headstock is designed to receive power from the motor by direct connection through a flexible coupling to the primary driveshaft. From here, the power is transmitted through a herringbone pinion and gear to the drive shaft proper, thence through the high- and low-speed frictions and sliding gears to the spindle, and finally through a sliding pinion to the chuck gear. All gears in the headstock are made of alloy steel, heat-treated, and have wide faces and coarse pitch. With the exception of the two herringbone gears, the Maag tooth form is used. The driving shafts run in ball or roller bearings.

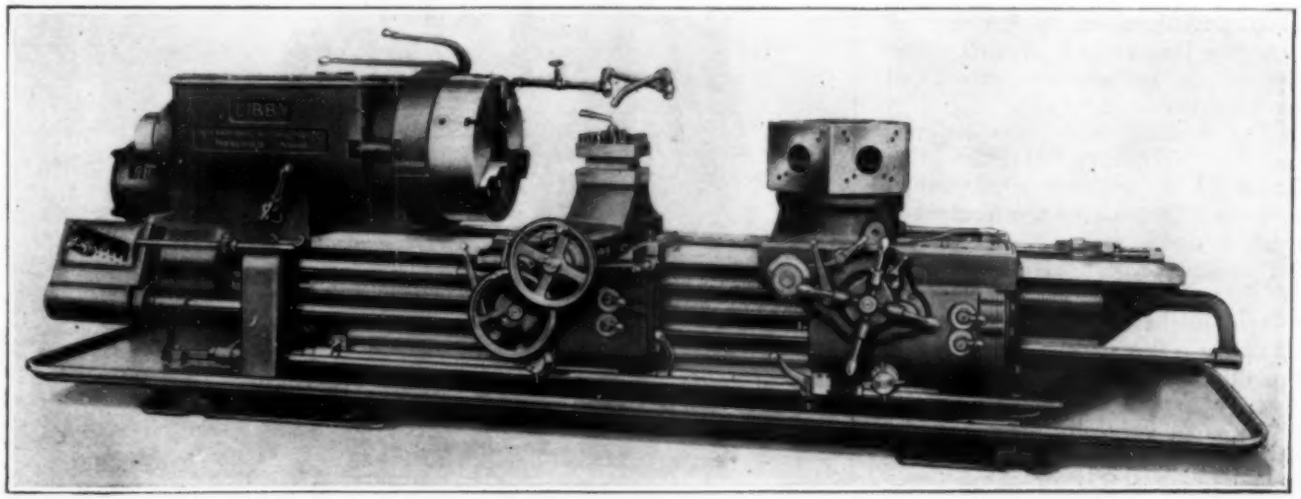
The main spindle bearings, however, are bronze, ground to a taper on the outside to fit corresponding tapers in the headstock housing. These bushings are adjustable by means of nuts at both ends. The front bearing is $10\frac{3}{4}$ in. in diameter by 11 in. long. The spindle is a 0.45-carbon steel forging and has a flange to which the chuck gear is fastened independently of the chuck. The spindle nose is threaded to receive the chuck itself, and the seat is tapered to center and hold the chuck securely. Spindle speeds are in geometrical progression, ranging from 8 to 125 rev. per minute.

The chuck body is also made from a steel forging and is especially designed for this machine. It is heavily constructed, but is said to be easy to operate. The top jaws can be removed from the bottom jaws, turned around, and adjusted in any position desired. A brake is also incorporated in the headstock to instantly stop the spindle when the drive clutch is released. Lubrication of the headstock is accomplished by the splash system. There are reservoirs and filters from which sufficient oil is carried direct to the main bearings.

The aprons are also designed for the splash system so that all running parts are thoroughly lubricated. Where possible, the shafts run in ball bearings. Both the tool post and turret aprons are built in units and are interchangeable. Both aprons have eight changes of speed, both forward and reverse. The gears are of alloy steel, casehardened. The feed box on the end of the machine carries a full set of change gears for cutting all standard threads. These feed gears run in oil. All feeds are uniform throughout for longitudinal, cross, and angular threads with the compound rest. The feeds range from $\frac{1}{2}$ in. to 1/28 in. per revolution of spindle.

The cross-slide has automatic feed trip in either direction, and power feed can be applied or released instantaneously. The toolpost slide has reversible cross feed independent of the longitudinal feed. When required, a compound rest can be furnished as special equipment. It has independent power, cross, and angular feeds.

The turret slide is of heavy construction and contains an oil reservoir for oiling the ways. The turret head is 21 in. across the flats, with a $4\frac{1}{4}$-in. bore. This head is clamped to the slide by means of double bevel rings. The lever for operating the lock pin and clamp-rings is placed on front of the slide where it is accessible to the operator. This turret slide is cast in one piece and extends over and under the back way. It is



"Libby" Type H Heavy Duty Turret Lathe

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adjusted by taper gib to take up wear.

Each carriage is provided with longitudinal feed dials that register the longitudinal movements of the carriage to the thousandth of an inch, so that work can be conveniently duplicated or the tool fed to any desired length accurately. Automatic stops can be applied.

The rapid traverse mechanism for both slides is located in the lower part of the headstock and is used for quickly moving both the tool post and the turret slides either way at the rate of 40 ft. per min. This mechanism is driven from the primary drive shaft, and all the gears run in oil. The shafts are carried in ball bearings. The operation of the rapid traverse is independent of all feeds. When rapid traverse is not in operation, the lead screws positively lock, so that quick traverse can be used during threading operations without losing the lead.

The lathe is supplied with a rack between the ways for positive lock on the turret slide, so that it can be used for turning heavy work on centers where required. Regular equipment includes a 24-in., three-jaw universal chuck, coolant pump, and wrenches. Extra equipment is a taper attachment, bar feed, hydraulically-operated chuck, cross-sliding turret, and the like. The machine requires a 25-hp., 1,800-r.p.m., constant-speed motor to drive. A ball bearing motor with special end frame for mounting into the machine is specified.

The machine weighs approximately 22,000 pounds.

Kingsbury Semi-Automatic Nut and Screw-Head Drilling Machine

IN THE construction of automotive engines, especially those employed to drive airplanes, it has become common practice to substitute for the well-known castellated nut and cotter-pin, a nut with a small hole drilled at a right angle to each facet, or flat, crossing the bore at corresponding angles. Small capscrews are also treated in the same manner, except that a clearance hole is first drilled axially at the center of the head so that the drills used in the cross-drilling will not be broken at the intersection. Wherever there is a group of screws or nuts on the machine, a wire is passed through one of the holes, in each nut in the direction most convenient and the free ends of the wire joined thus securing all in the group against the danger of working loose.

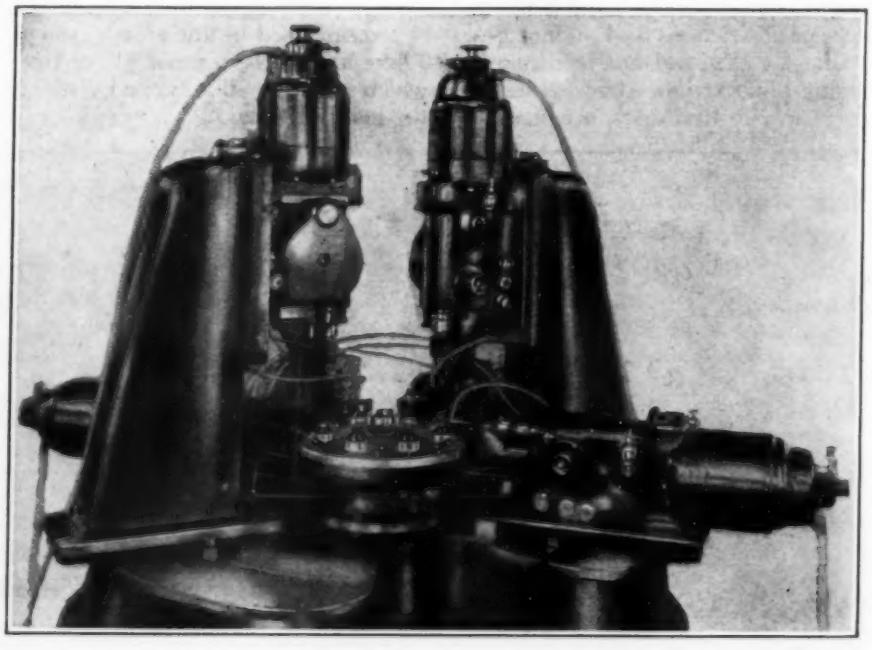
The machine shown was designed by the Kingsbury Machine Co., Keene, N. H., to handle either screws or nuts. The base of the machine is circular, and contains a reservoir for the coolant to be used on the drills, which is circulated by a pump immersed in the liquid. At the center of the base is a seven-position indexing turret, rotating about a vertical axis. Carried in this turret are seven small vertically disposed spindles, each of which has a six-position indexing movement of its own, independent of but acting in conjunction with the movement of the turret. Each small spindle is fitted with a collet to hold the work to be drilled.

At the top of the base of the machine is a circular ledge, or shelf, partly to be seen in the illustration. This ledge is machined smooth and provided midway of its width with a T-slot so that a number of Kingsbury sensitive drilling heads may be secured in whatever position may be desired by means of T-head bolts or capscrews with flat nuts to fit the slot.

Secured in this manner to the circular shelf are six of the drilling heads; four with spindles horizontal and radially disposed with relation to the vertical centerline of the turret, and two in an upright position. The Kingsbury drilling head is entirely self-contained and is driven by an electric motor built into the housing. Automatic feed is provided by a cam that derives its motion through a friction device to allow the feed to slip before the pressure becomes sufficient to cause breakage of the drill. This drilling head was described on page 666, Vol. 57, of the *American Machinist*.

The action of the machine is as follows: A nut or capscrew is placed by the operator in the collet of the small spindle, which is, at the moment, in idle, or loading, position, and the turret is indexed to bring the piece under the first of the upright heads—shown at the left in the illustration. The piece is reamed or drilled as the circumstances may require. The work-holding spindle remains stationary at this time.

The second movement of the turret brings the work to the first of the horizontally-disposed heads, thus presenting one facet squarely to the drill, which passes clear through transversely. During the third movement of the turret the work-holding spindle also indexes through one-



Kingsbury Nut and Screw-Head Drilling Machine

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sixth of a turn to present an undrilled facet to the second cross-drill. On the next, or fourth, turret movement, this action is repeated.

Again indexing, the turret brings the work under the second upright head to be counterbored, and any bur that may have been thrown up in the axial bore by the cross-drills is thus removed.

Advanced by the turret to the sixth position, the work-holding spindle now presents to the fourth horizontally-disposed drilling head a nut or screwhead having a transverse hole in each of its six facets. The work-holding spindle, having up to this time made but two indexing movements, now indexes rapidly through its cycle of six positions and presents each facet in turn to the countersinking tool. This tool is held in the chuck of the drilling head and comes forward at each step to chamfer or countersink each of the six small holes. This movement is performed very rapidly and requires no more time than that required to drill one of the cross-holes. Hence the latter operation sets the cycle time of the machine.

The machine produces a completely drilled and countersunk part at each indexing movement of the turret after the seven stations have been filled. The position of the drilling heads on the circular ledge may be altered at will to suit any combination of operations. The vertically-disposed heads are exactly the same as the horizontal ones, being the same mechanism mounted on the upright face of a suitable pedestal. The feeding movement may be single or multiple, fast or slow, according to the cam that is used.

There are seven electric motors on the machine, one on each of the drilling heads and one to operate the turret mechanism. No belts are employed. Separate control is provided for each motor. The machine occupies a floor space of approximately 5½ ft. square. It handles screws and nuts up to ⅛ in. in diameter.

Improved "Pyro" Optical Pyrometer

Improvements and simplifications have been made in the "Pyro" optical pyrometer made by the Pyrometer Instrument Co., 74 Reade St., New York, N. Y. The instrument was

Improved "Pyro" Optical Pyrometer

previously described on page 192, Vol. 66, of the *American Machinist*. It was designed for particular use in measuring the temperature of small glowing bodies, not inclosed and not having the characteristics of a black body, or for the measurement of the temperature of pouring metal.

The instrument is used like a telescope, and it magnifies the object four times. The object appears in its actual colors and the light rays pass through the objective and a series of prisms to the eyepiece. The plane of the prism has a small transparent test mark which appears to the eye as an elliptical ring. This ring is lighted by a standard electric lamp receiving current from a dry cell. The elliptical ring is used as a standard of brightness, and by means of a circular colored filter with graduated density the brightness of the object is made to match the test mark. A scale turns with the graduated filter and indicates the corresponding temperature. A red filter is also inserted in the optical system to assure monochromatic light. The normal range of the instrument is 2,000 to 3,200 deg. Fahrenheit.

A master lamp is supplied to check the instrument and a rheostat and miliammeter is provided to adjust the current to the standard value. The instrument is provided with a leather case and is conveniently carried on a leather strap. The weight is 3 lb. in the case.

The unit is self-contained and is simple in operation. The entire adjustment can be made without changing the position of the hand. Electric contact is made by finger pressure and is broken when the pressure is released. It is claimed that temperature variations of a very close range can be made. The field of vision is large and distinct.

"Mighty Midget" Unishear

By applying the same cutting action as used on the larger machines, the Unishear Co., Inc., Flatiron Bldg., New York, N. Y., has developed a light-weight portable power cutting shear to replace hand shears. This tool, shown in Fig. 1, is known as the "Mighty Midget" Unishear. It has a capacity for cutting sheet iron up to No. 18 gage (0.05 in), aluminum or brass up to No. 16 gage (0.0625 in.), and cardboard, linoleum, fiber and other soft materials in proportion. The minimum radius that can be cut is 1 inch.

The unit is driven by a Dumore ⅛-hp. universal electric motor. It op-

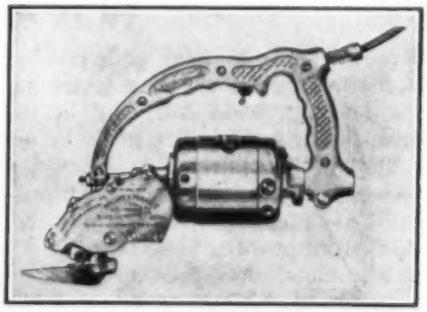

Fig. 1—"Mighty Midget" Unishear

erates from any lamp socket, 10 ft. of rubber-covered cable and a plug being supplied, at either 110 or 220 volts as specified. A toggle switch is mounted in the handle. The motor drives through a bronze worm and wormwheel and, by means of a crank mechanism, transmits oscillatory movement to the upper shear blade. Norma-Hoffman ball bearings

Fig. 2—The unit mounted in a cradle for bench use

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are used throughout, and a setscrew controls the armature end play.

The lower shear blade is stationary and is mounted on a yoke. This yoke is pivoted on a column, about which it is swung to vary the blade clearance for various thicknesses of material being cut. Hollow hexagon setscrews of special small size are used to hold the blades in place. The blades, which are made of Poldi steel, heat-treated for proper hardness, are thus readily removable. They can be easily resharpened by grinding the straight parts of the cutting edges. The yoke is also heat-treated and is of a shape that permits the tool to be turned in any direction. With the motor operating at full speed about 2,000 cutting strokes per minute take place.

A pivoted duplex handle provides a convenient grip for holding the unit in any position. This handle can be swung about its end and locked in place with a wing nut. For bench use, a cradle is supplied with a flexible steel strap and thumb-screw clamp. A Yale lock is furnished to prevent theft of the tool. With the machine in the cradle, the yoke is uppermost, as can be seen in Fig. 2, and the operator pulls the material through the blades.

Long and Allstatter Open-Throat Press Brake

IN ORDER to hold deflection of the main members to a minimum, the housing, slide and base in the **open-throat press brake**, made by the Long and Allstatter Co., Hamilton, Ohio, are made of annealed steel castings of ample proportions to take care of all possible loads.

The clutch has been designed to transmit the entire driving power without slipping, yet is flexible enough to prevent breakage of the machine in case of overload. It is a multiple-disk design and the plates are provided with asbestos friction lining and operate dry. Low unit pressures are used to assure long life to the plates. The slide can be stopped at any part of the stroke as the clutch is easily disengaged. At the instant of release a large friction brake is applied which stops the slide. In conjunction with the clutch is a flywheel which is mounted on Timken roller bearings. It has sufficient inertia to prevent undue overloading of the motor.

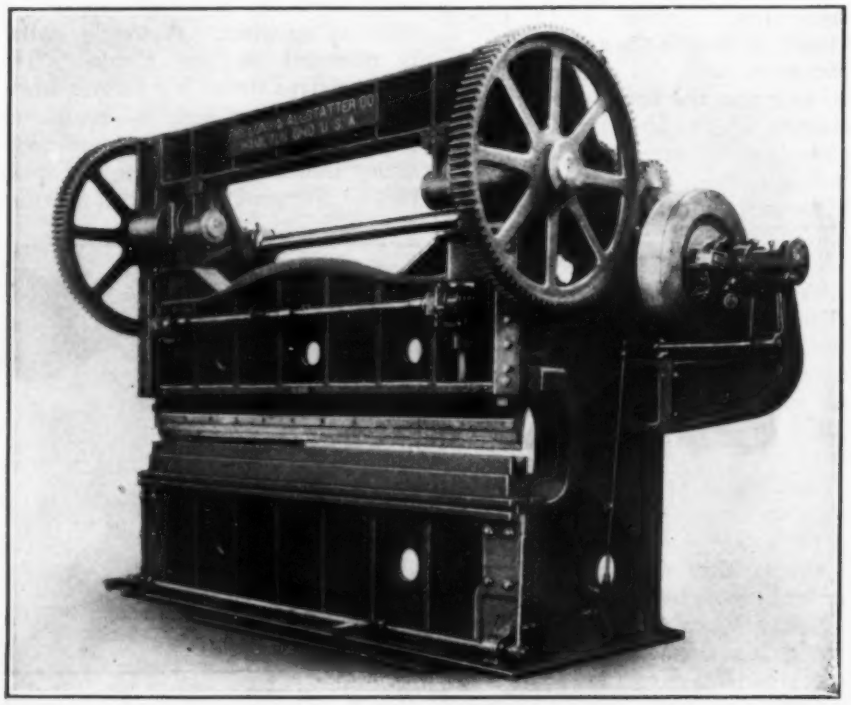
A train of spur gears takes the power from the clutchshaft to the camshaft. All gears are made of steel with accurately machine cut teeth and the camshafts are high-carbon steel forgings. The cams are forged integral with the shafts.

The pendulums operate in the upper part of high-carbon steel screws, which have coarse buttress threads. This design is said to give approximately 75 per cent longer bearing length to the slide over that possible through the use of former designs. The pendulums are made solid.

The slide itself is adjusted by a small motor mounted on the rear of the slide and driving through a chain and worm gearing. The pendulum screw is stationary at all times and the worm wheel itself revolves about the screw when lowering or raising is desired. At all times the position of the adjustment is indicated on a graduated steel scale mounted on the slide. The worm and wheels are inclosed and run in a bath of oil. This adjusting motor is furnished as standard equipment.

The standard drive to the unit is through a belt from the motor to the flywheel, in conjunction with a ball-bearing self-adjusting idler. Texrope or any other type of drive can be furnished, if desired. For a.c. circuits, a high-torque, squirrel-cage motor is recommended, and for d.c., a compound-wound motor.

The press brakes are made in eleven sizes ranging from 6 ft., 6 in. to 14 ft., 6 in. between housings. The standard stroke in all cases is 3 in., and the slide adjustment is 6 in. The speed of stroke is between 25 and 30 strokes per minute. The power required varies from 15 to 40 horsepower.



Long and Allstatter Open-Throat Press Brake

C. & P. Welded Steel Bench Legs and Drawers

The C. & P. Electric Works, Inc., Springfield, Mass., is manufacturing by the electric welding process steel legs and drawers for factory benches. These parts are made in all standard sizes of No. 16 gage steel, the various sections being blanked and formed on presses and spot-welded together. The features claimed are lightness combined with strength, freedom from breakage, and ease of repair when damaged.

The bench leg, shown in Fig. 1, consists of nine separate pieces.

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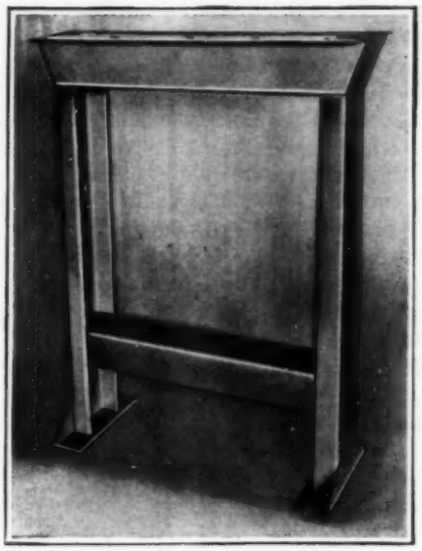

Fig. 1—C. & P. Welded Steel Bench Leg

Countersunk holes in the upper flanges provide means to secure them to the bench with wood screws, and holes in the pedestals allow them to be lagged to the floor.

The drawer, Fig. 2, is self-contained and requires no extra parts to secure it to the bench. The cover plate at the top is beaded over at the edges to form runways in which the outwardly turned flanges at the sides of the drawer may slide. This cover plate is fastened by wood screws to the underside of the bench, and when the drawer is closed it prevents dirt from working through the cracks of the bench to the drawer.

A handle is provided on each drawer, and also a staple and hasp so that the drawer may be secured with a padlock, if desired. Sliding tills of any size may be furnished as ordered.

Any desired size or leg of drawer may be furnished to specifications.

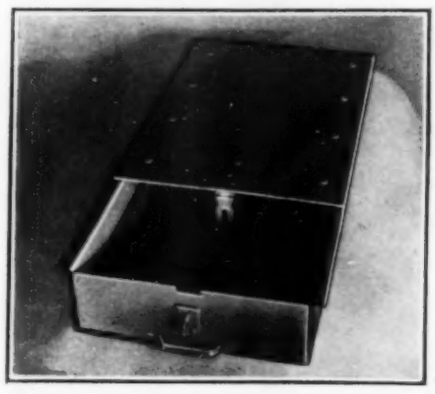

Fig. 2—C. & P. Welded Steel Bench Drawer

Abrasive No. 5 Surface Grinding Machine

THERE was recently developed, by the Abrasive Machine Tool Co., Providence, R. I., an improved and larger model of its surface grinding machine for the particular purpose of finishing large dies and similar work with the rapidity of production routine and the precision of toolroom practice. The unit is entirely self-contained, having the driving motor in the cabinet base and all switch-boxes and push-button controls permanently attached. It is shown in the illustration.

The motor is connected through a flexible coupling to an extension shaft, which is wholly within the base of the machine, and on which are mounted pulleys to drive the wheel-spindle, the table movements, the circulating pump, when water equipment is used, or the fan, when the machine is fitted for dry grinding. If desired, a small d.c. generator is included in the equipment to furnish current for magnetic chucks. In this case, the generator is mounted on the base and driven by belt from the extended motor shaft.

The 4-in. wheel-driving belt passes from the driving pulley up through a channel inside the column, over two fixed idlers at the top, down through the opposite side of the column under a weighted idler, then up over the spindle pulley, from whence it returns directly to the driving pulley. The direction of rotation is such that the pull of the belt is downward upon the spindle and all idlers are on the slack side. The weighted idler is guided vertically by two rods fixed in the machine base. Its movement automatically compensates for vertical adjustment of the grinding head over the full range of movement, so that correct belt tension is maintained at all times. Springs in the lower end of the guide-rods cushion the shock in case the idler should fall because of a broken belt. All idlers, as well as all shafts and feed screws of the machine, are carried on ball bearings.

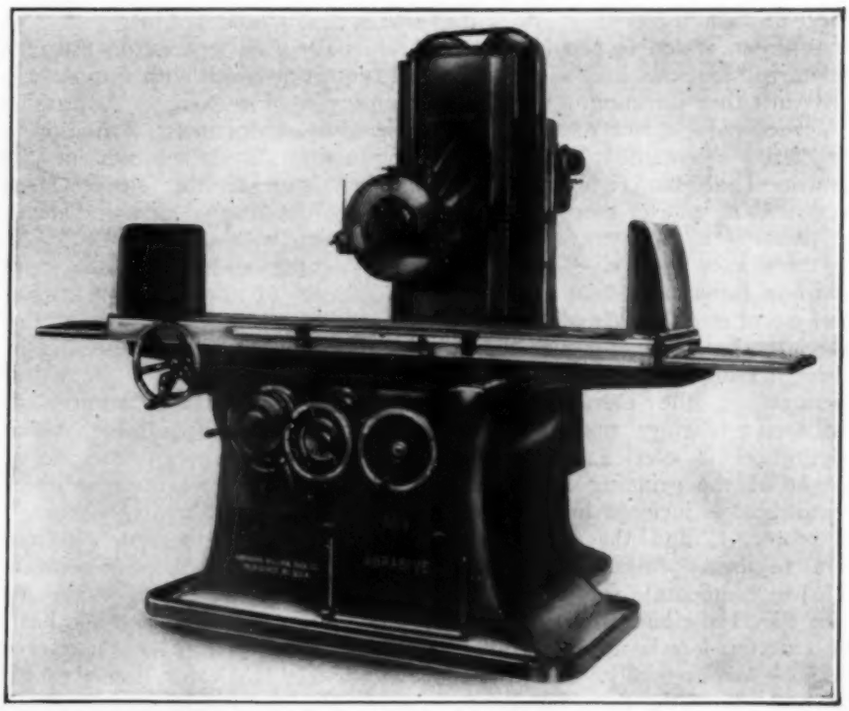

Fig. 1—Abrasive No. 5 Surface Grinding Machine

The table movements are derived through a gear-box so constructed as to be easily removable as a unit. The case of the gear-box forms a reservoir to hold about 10 qt. of oil, in which the gears and clutches are partly immersed. Within the gear-box also is a hydraulic cushioning device to ab-

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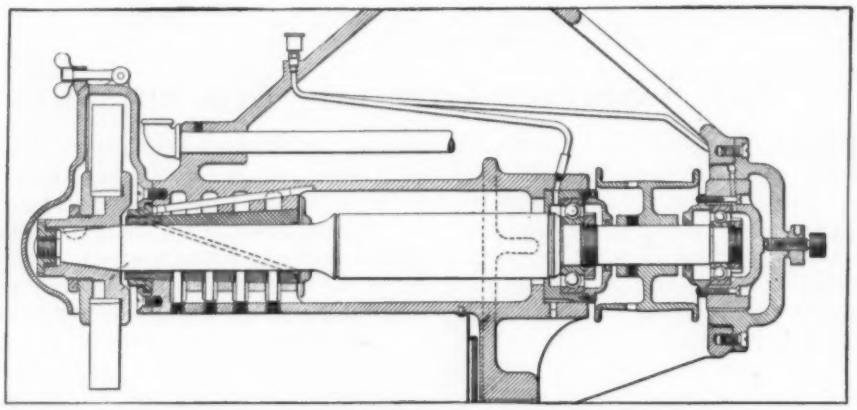

Fig. 2—Details of the wheel spindle and bearings

sorb the shock of reversal at each end of the table stroke. The table traverses at 25 ft. per minute.

Two large V-ways located at the end of the bed carry the saddle, which is also further supported by a substantial flat way directly under the grinding wheel. The middle handwheel in the illustration operates the cross-screw, which is provided with ball thrust bearings and with power feeds in either direction.

Vertical adjustment of the grinding head is obtained through the handwheel at the right, which is graduated in quarter-thousandths, or by power for rapid traverse. The last movement is derived from the gear-box through a silent chain. A steel worm on the shaft of the handwheel meshes with a bronze wormwheel, having an integral nut that operates on the elevating screw. Ball thrust bearings, upon which the wormwheel is carried, sustain the weight of the grinding head. The wormwheel is inclosed in a chamber to protect it and the screw from abrasive dust. Adjustment is provided to compensate for wear.

In Fig. 1 the handwheel shown at the extreme left is used to traverse the table longitudinally. Immediately behind each of the three handwheels is a clutch-lever by which power may be applied to traverse the table, to elevate or lower the grinding head rapidly, or to feed the saddle in either direction. When any of the power movements is engaged, the respective handwheels are automatically thrown out. Safety dogs on the cross and vertical movements prevent overrun. The traverse of the table is automatically reversed at any point within its range by the usual table dogs. Cross-feeds may be actuated at either or both reversals, as desired.

The wheel spindle is made of tool steel, hardened and ground all over. It is carried upon two combination radial thrust ball bearings, located on each side of the belt pulley, and upon a phosphor bronze split-sleeve bearing at the wheel end. This construction is clearly indicated in Fig. 2. The bronze sleeve is tapered on the outside and is provided with ring nuts to compensate for wear. Adjustable tapered-head drawbolts, fitting in a longitudinal dovetailed slot in the bearing, prevent the sleeve from pinching the journal and operate in conjunction with the endwise movement of the sleeve to allow close adjustment of the bearing without danger of binding.

It is possible to remove the spindle, including the pulley and both ball bearings, as a unit from the grinding head by removing the screws that hold the flange of the cover to the rear of the head. The compartment in which the spindle is contained constitutes a reservoir for oil to lubricate the front bearing. This oil is kept in constant circulation by an impeller on the spindle immediately behind the bearing, as can be seen in the illustration. A sight-feed lubricator, located on the column of the machine, delivers oil through tubes to all bearings in the base. A different grade of oil is used on the front spindle bearing from that on the ball bearings and is supplied to the reservoir in the head through a filler cup. Filler cups are also provided for the bearings of the overhead idlers, which are above the level of the gravity feed system. The ways of the table and saddle are oiled through a cup on the saddle.

Any standard electric motor of 5-hp. capacity, running at 1,100 r.p.m., may be used to drive the machine. An overhead countershaft is furnished upon order, in case belt drive is desired. When used for dry grinding, an exhaust fan and dust separator are attached as integral units to the machine. For wet grinding, the machine is equipped with a circulating pump. In the last case, a compartment in the machine base contains a supply of coolant which drains to it from channels in the table through a separate settling tank, which is easily removable for cleaning.

The machine is built in two sizes, having a longitudinal table travel of 40 and 48 in., respectively. The two machines are alike in other details. The cross-movement has a range of 15½ in., and the vertical adjustment of the grinding head is 14 in. Grinding wheels up to 14 in. in diam. by 1½-in. face may be used. The floor space occupied is 169 in. longitudinally by 72 in. transversely. The weight is approximately 7,200 lb. without the driving motor.

Besly No. 309 Vertical-Spindle Disk Grinders

Two small sizes have been added to the No. 309 line of vertical-spindle, motor-driven disk grinders, made by Chas. H. Besly and Co., 118 N. Clinton St., Chicago, Ill. Heretofore the smallest size was 40 in. The illustration shows the 30-in. size, but the model is also made in an 18-in. size. The machines can be used in conjunction with semi-automatic fixtures as used on the larger machines. They can also be used wet.

Besly 30-Inch No. 309 Vertical-Spindle Disk Grinder

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A wheel dresser is attached on the crossbar as shown, thus insuring a square-faced abrasive at all times. The bar on which the dresser slides also prevents the work from revolving. Additional work-holding bars can be installed so that several pieces can be ground at one time.

The 30-in. model is driven by a 10-hp. a.c. motor at 860 r.p.m. The disk is 33 in. from the floor, and its rated capacity under thrust load is 2,000 lb. The net weight of the unit is 1,565 lb., and the weight crated 1,755 pounds.

The 18-in. grinder is driven by a 5-hp. motor at 1,800 r.p.m. The domestic shipping weight is 800 lb. net.

Hoefer High-Production Drilling Machine

BY BUILDING the entire driving mechanism within the column and the head, the Hoefer Manufacturing Co., Freeport, Ill., has been able to eliminate protruding attachments, such as gear boxes, the motor, and driving pulleys, without sacrificing rigidity in the high-production drilling machine, shown in the accompanying illustration. It can be operated as a plain drilling machine or with such appliances as a multiple head, fixtures and an indexing table, which also become an integral part of the machine. Consisting of a heavy, ribbed section, the base contains a sump for the cutting lubricant and has suitable strainers to prevent chips from entering. The column is of box type, well ribbed and constructed to house parts pertaining to the table feed. The head has the spindle drive and feed units, as well as the motor contained in it, and a housing attached to the head completely covers the spindle and the counterweight. This construction renders a symmetrical appearance to the machine, besides inclosing all moving parts. As a plain drilling machine, the knee-type table, attached to the column with ample sliding surfaces, consists of a plain platen surrounded by an oil channel. When work conditions demand, an automatic indexing table is furnished in place of the standard platen. The number of indexes of this table range from two to ten and are controlled by pick-off gears, timed so that the indexing movement coincides with the table travel.

Hoefer High-Production Drilling Machine

Power is transmitted from the motor to a constant-speed shaft by a silent chain, then to a horizontal drive shaft through pick-off gears. The spindle is driven from the horizontal shaft through helical crown gears. All bearings are of either ball or roller type to reduce friction and to assure that maximum power be delivered to the spindle.

The spindle is made with multiple splines to engage the crown gear drive. It has a self-aligning ball thrust bearing mounted on it to absorb the thrust of the work. The drift slot is easily accessible, and the end of the spindle has a driving slot milled in it.

The machine is started and stopped by push-button control. A star wheel is provided for hand operation of the spindle, and a hand lever, located within reach of the operator, controls the engagement of the power feed.

A "One-Shot" lubrication system is provided in conjunction with a reservoir of ample capacity, mounted in the head. The pump is located within the column and is operated by a plunger at the side of the machine. By this means, each outlet, of which there are twenty-eight, receives lubrication with one motion of the pump plunger.

When multiple-spindle heads are used, they are bolted directly against the head of the machine instead of being mounted on the spindle nose. With this installation, special table feeds are employed. When the machine is equipped with both spindle feeds and table feed, the construction is such that they cannot be operated at the same time. The table feed may consist of either screw feed, cam feed or hydraulic feed, each of which is furnished for either hand or automatic operation. The feeds furnished to the table include a rapid-approach feed, a work feed, a rapid withdrawal, and an automatic stop. Adjustable stops are furnished to control the length of travel of each feed movement.

SPECIFICATIONS

Distance, center spindle to face column, in.	12
Spindle travel, in.	12
Taper in spindle, Morse	No. 4
Maximum distance from spindle to plain table, in.	28

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Maximum distance from spindle to indexing table, in.	25
Working surface of plain table, in.	18x24
Diameter of indexing table, in.	22
Table travel, standard table, in.	16
Table travel, indexing table, in.	12
Range of feeds (8), in. per rev.,	0.005 to 0.125
Range of speeds (8), r.p.m.	100 to 600
Floor space, in.	30x50
Net weight (approximately), lb.	3,000

A 5-hp. motor contained within the head, is standard equipment. A 7½-hp. motor can be furnished, however, if required. In either case, the motor has a speed of 1,750 r.p.m. and is accessible through a door.

Reliance Type AA Fully-Inclosed Fan-Cooled Induction Motors

A line of fully-inclosed, fan-cooled, induction motors with ball bearings for use on two- and three-phase a.c. circuits was recently announced by the Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland, Ohio. Fan cooling has been resorted to in order to dissipate the heat so that the frame can be greatly reduced in size and weight over a non-ventilated inclosed fan of the same rating.

Internal fans are used to circulate the air around the coil heads where a large part of the heat is generated. This circulation of air causes the heat to be transmitted to radiating bonnets that entirely surround the coil head and protect the motor against the entrance of dirt. Across the outside surface of these radiating bonnets a strong blast of air is also blown that absorbs the heat from the bonnet and carries it into the surrounding atmosphere. This cooling air also passes across the outside of the stator core.

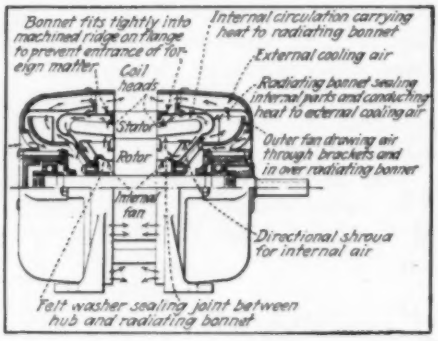
Bonnet fits tightly into machined ridge on flange to prevent entrance of foreign matter
Internal circulation carrying heat to radiating bonnet
External cooling air
Coil heads
Radiating bonnet sealing internal parts and conducting heat to external cooling air
Stator
Rotor
Outer fan drawing air through brackets and in over radiating bonnet
Internal fan
Directional shroud for internal air
Felt washer sealing joint between hub and radiating bonnet

Fig. 2—Cross-sectional view of the Inclosed Fan-Cooled Motor

The blast of air is produced by large radial fans situated at each end of the motor shaft just outside the bonnet, as can be seen in the cross-sectional view, Fig. 2. The additional parts required for the secondary ventilation and inclosing are all inside the motor frame. The external appearance and limiting dimensions are the same as the standard induction motor of the same frame size.

Among the advantages claimed for this type of motor are protection of motor windings against dirt and moisture, and protection of the air gap against clogging. Electrical and operating characteristics are the same as those of open motors and the increase in friction and windage losses due to the external fans is said to be negligible.

The motors are made in sizes from 1½ to 10 hp., with speeds of 900, 1,200 and 1,800 r.p.m. They are for use on 220, 440 and 550-volt circuits, 60 cycle, two or three phase, and are rated at 55 deg. Centigrade.

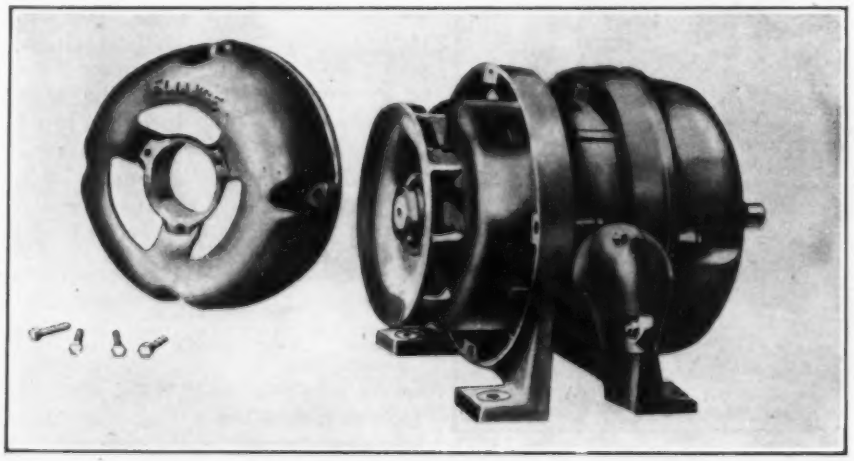

Fig. 1—Reliance Fully-Inclosed, Fan-Cooled Motor

Worm-Generating Attachment for Cone Automatic

The Cone Automatic Machine Co., Windsor, Vt., has brought out an attachment by which a worm of any size within the capacity of its automatic turning machine may be generated before the stock is cut from the bar. The work is done in the third spindle position and does not interfere with operations that may be performed by the tools at the other stations. A worm is completed at each indexing movement of the machine.

The attachment takes the place of the longitudinal slide at the rear of the machine. In the illustrations are

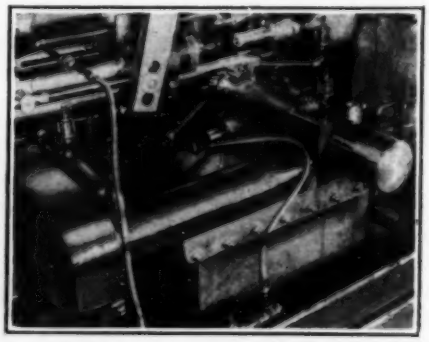

Fig. 1—Worm-Generating Attachment for Cone Automatic Turning Machine

shown the stationary member to which the slide of the attachment is gibbed, the slide itself, the master-screw at the left, that determines the pitch of the worm to be cut, and the cutter. This generating cutter is similar in shape and action to the cutter of a Fellows gear-shaper cutter.

The slide, with its attached parts, is advanced in the usual manner by a cam on the camshaft above the machine. The master-screw is driven at a uniform rate through a train of gears from the main driving shaft of the machine. The pitch of the worm to be cut depends upon the pitch of the master-screw, and any desired pitch may be cut by using a corresponding master-screw and cutter.

The action of the mechanism is simple. The master-screw, constantly driven through its train of gearing, revolves at a definite rate with relation to the machine spindle. The screw does not, however, advance with the slide. Instead a wormwheel (inclosed in a case and meshing with the master-screw) rolls upon the

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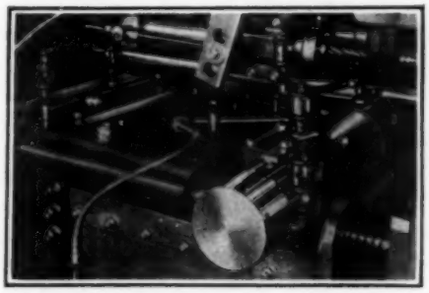

Fig. 2—Worm-Generating Attachment showing the exposed end of the master-screw

threads of the screw as upon the teeth of a rack as the slide advances. When the slide returns, quickly, at the end of its movement, the cutter rolls off the worm being cut as if the latter were, too, a rack and the cutter an engaging pinion.

The two movements—rotation of the cutter and its rolling movement as the slide advances or recedes—though acting together are really independent of each other. The rate of advance of the slide has nothing to do with the pitch of the worm being cut; it merely governs the depth of cut, or amount of stock removed per revolution of the work.

It is highly essential, however, that there be no slip, either rotatively or endwise, of the bar in the collet. Hence special collets, keyed to the spindles, are employed.

In Fig. 2, the exposed end of the master-screw is shown. Ordinarily it is covered with a guard.

Bryant Special No. 20 Grinder for Crankshafts

THE Bryant Chucking Grinder Co., Springfield, Vt., has recently completed a special machine to grind the holes in the ends of crankshafts for automotive engines. The special features consist of an extra length of bed, a lever-operated mechanism to close the driving collet, a disappearing table to assist the operator in placing the heavy shaft in the machine, and a special steady-rest to provide a support for the end of the shaft while grinding. The illustration Fig. 1 gives a general idea of the machine, while Fig. 2 shows some of its special features.

At *A* in Fig. 2 is a flat table to provide a support upon which the crankshaft is laid to facilitate entering the end in the driving collet. This table is in three sections, the front and rear sections being rigid and at constant level. The center section *B* is capable of a vertical movement through a distance of 4 to 5 in. actuated by the same lever that closes the driving collet.

With the machine in its unloaded position, the center section of the table is level with the front and rear sections, so that there is a continuous flat surface extending across the width of the machine bed. A crankshaft laid upon this surface is supported at the proper height to allow the end to enter the driving collet without difficulty and the outer end to drop easily into the steady rest. When the operator pulls the proper lever forward to close the driving collet upon the work the same movement causes the center section of the table to drop to the position shown in Fig. 2, where it does not interfere with the rotation of the cranks when the machine is set in motion by the operator.

The upper member of the steady rest is hinged and counterweighted to remain open. The movement of a lever lowers it to and clamps it in its working position.

The spool-shaped piece *D*, Fig. 2, is a gage by which the Micarta shoes

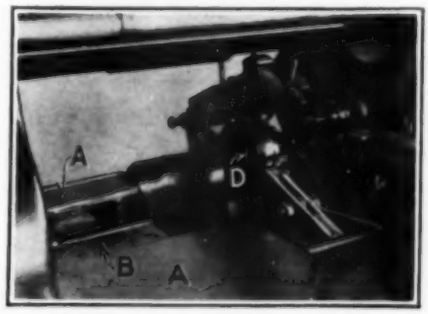

Fig. 2—The steady rest and disappearing table

of the steady rest are adjusted to central position. The body of the rest is bored concentric with the centerline of the machine, and the flanges of the spool are ground to a diameter to fit this bore.

The spool is placed in the rest and the upper member of the spool clamped in working position, so that the spool is held tightly in exact central position by its flanges. The shoes of the rest are then advanced by means of their adjusting screws to bear upon the middle shoulder of the spool, which is ground to the same diameter as the shoulder by which the crankshaft is supported in the rest.

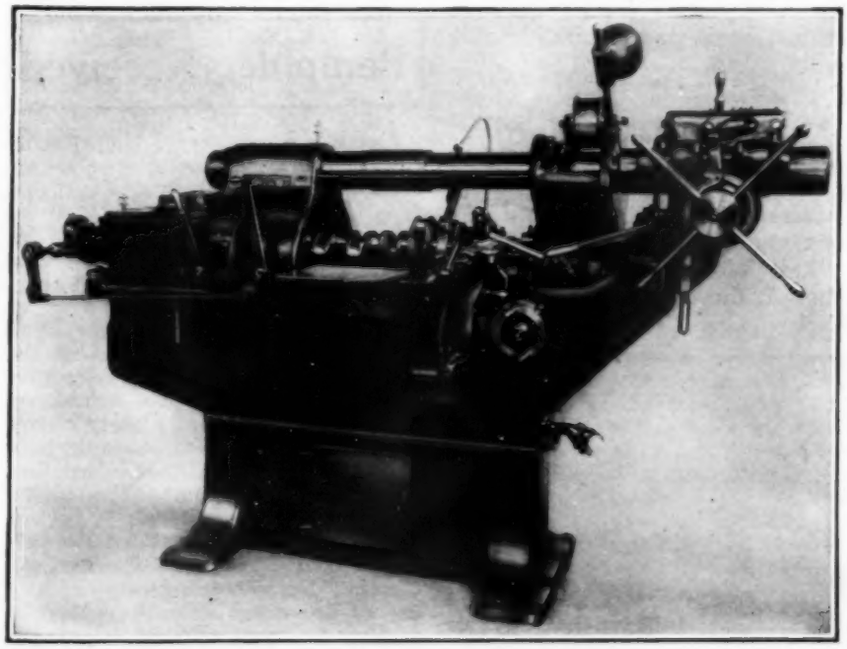

Fig. 1—Bryant Special No. 20 Grinder for Crankshafts

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Fairbanks-Morse Inclosed Self-Ventilated Motors

A line of inclosed self-ventilated motors was recently developed by Fairbanks, Morse & Co., Chicago, Ill. Because of the ventilation, it is possible to build this line in the same frame diameter as standard motors of corresponding horsepower. It is also possible to maintain the same power factor and efficiency, not otherwise possible in an inclosed motor. An outside view of one of the motors is shown in Fig. 1, while in Fig. 2 a cross-sectional view is presented to show the internal construction.

This type of motor has a standard stator core and windings and a standard rotor mounted on self-aligning ball bearings. The supporting shell has an annual air passage between the outside surface of the stator core and the shell. Winding shields are provided so that the stator windings are totally inclosed, thereby preventing any dirt from gaining access to these windings. Cooling air is drawn through an inlet at the free end of the motor by means of a special type of fan that also functions as an air cleaner. The clean air is blown across the winding shield at the free end of the motor through the annual air space, then across the outer end of the stator core laminations, thence across the winding shield at the pulley end and out through openings in the pulley end bearing arm.

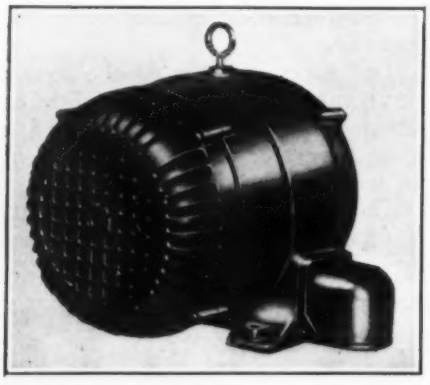


Fig. 1—Fairbanks-Morse Inclosed Self-Ventilated Motor

The fan is of the closed impeller type and is so constructed that the foreign particles are thrown out by centrifugal force between the edge of the outer shroud and the supporting frame. A perforated guard carried by the supporting frame, is placed around this fan cleaner in order to prevent accidental contact with the fan, when inspecting the motor. The fan itself is an entirely self-contained air cleaner and blower.

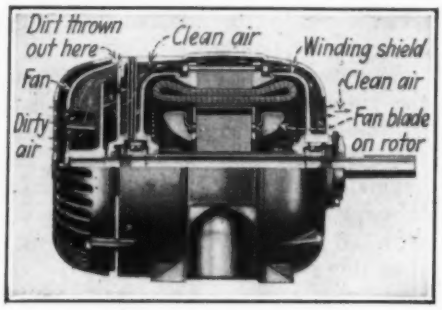


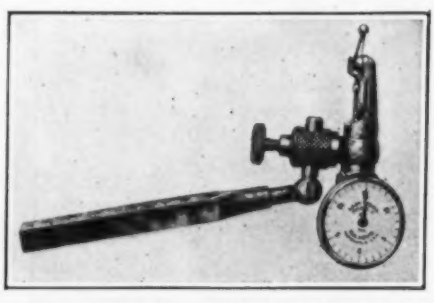
Fig. 2—Cross-sectional view of the Fairbanks-Morse Inclosed Self-Ventilated Motor

Provision is made for lubricating the ball bearings of this motor without removing the guard, fan or bearing arms. This is accomplished by the use of a plunger device located in a grease tube extending through an opening in the bearing arm into the bearing housing.

Several important advantages of this type of motor are pointed out: It is completely self-ventilated and is impervious to dust and dirt in the air; hence it will operate in the dustiest locations without requiring any blowing out. Since the windings are totally inclosed, the fire hazard is also reduced. No outside air piping of any kind is required. The machines are said to require no more attention than standard ball-bearing motors.

Model F "Last Word" Indicator

Measurements in practically any direction can be made with the Model F "Last Word" indicator made by Henry A. Lowe, 1874 East 66th St., Cleveland, Ohio. The universal shank supplied allows the indicator to be swung through a complete circle at any angle. It is thus possible to make contact with any part of a hollow sphere except the hole through which the instrument is introduced. The indicator is held to the shank through a friction-type knuckle joint, which is held tight by the jaws of the shank.



Model F "Last Word" Indicator

The indicator proper has a tubular swiveling body held friction tight in a spring clamp so that it can be turned to the right or left as well as above or below the shank. The action is reversible by means of a switch lever, underneath the dial on the right side of the body, which allows contact motion to take place in either direction.

The contact piece has fine radial teeth on its inner flat side that interlock with a corresponding series of teeth on the long lever of the indicator. The two series of teeth are held in contact by a spring clip. This spring clip swivels and can be swung aside to allow the contact piece to be interchanged for one of different shape. The contact piece can be pushed around to any desired position without swinging the spring clip.

Every part of the indicator is made of hardened steel with the exception of the bezel, which is of nickel silver. The range of the instrument is 0.030 in. in either direction. The ratio of movement between the contact piece and the end of pointer is 90 to 1. Without the shank the unit weighs 1¼ ounces.

Pamphlets Received

LEATHER FOR PACKING. United States Government master specification for hydraulic packing leather is now available. It is known as circular No. 340 of the Bureau of Standards and may be obtained from the Government Printing Office, Washington, D. C., for five cents.

WELDED ROOF TRUSSES. The Linde Air Products Co., 30 East 42nd St., New York, N. Y., has published the results of tests made on welded, inserted-plate joints in Fink-type roof trusses. They are published in the form of a pamphlet entitled "Oxwelded Roof Trusses" by H. H. Moss. The publication contains seventy-two 8½x11-in. pages and is well illustrated throughout by photographs, line drawings and charts. Design calculation of the trusses are given and the method of loading the trusses is explained and all the various failures are analyzed.

NEWS OF THE WEEK

McGraw-Hill and A. W. Shaw Form Subsidiary

Incorporation of a subsidiary to publish four long-established industrial publications just acquired was announced last week by the McGraw-Hill Publishing Co., of New York, and the A. W. Shaw Co., of Chicago. The subsidiary is the McGraw-Shaw Co., and the papers affected are *Factory, Industrial Management, Industry Illustrated* and *Industrial Engineering.* Under the announced publishing plan, the first two papers will be combined as *Factory and Industrial Management,* starting with the January issue. The third paper will be consolidated with *Industrial Engineering,* a McGraw-Hill publication established in 1882, starting with the December issue.

Facts underlying the formation of the subsidiary were outlined in a statement issued by James H. McGraw, president of the McGraw-Hill Publishing Co.

The statement by Mr. McGraw stressed the fact that the arrangement by which the two parent companies control jointly a subsidiary publishing important publications devoted to industry is in no sense or degree a merger of the McGraw-Hill and Shaw groups of journals. He pointed out that the two companies have effected a separate subsidiary organization to serve more adequately in a publishing way those manufactures whose broad marketing problems extend throughout the range of industry.

James H. McGraw is chairman of the board of the McGraw-Shaw Co. A. W. Shaw is president. Malcolm Muir, vice-president and director of sales of the McGraw-Hill publications, and Wheeler Sammons of the A. W. Shaw Co., form the management committee. G. E. Conkling of the McGraw-Hill organization, has been assigned to the new company as acting publisher.

Rail Transit Demands Falling Off Now

Transportation requirements for twenty-seven of the principal commodities in the fourth quarter this year (the months of October, November and December), will be approximately 174,000 cars below the same period last year, or a decrease of 1.9 per cent, according to reports received from the American Railway Association.

On the basis of reports compiled from information collected by the various commodity committees of the thirteen Shippers' Regional Advisory Boards, the association estimates that 9,232,000 cars will be required to move those commodities in the last three months this year compared with 9,406,000 cars for the same months in 1926.

The six boards that estimated an increase over the preceding year were the Middle Atlantic States, Ohio Valley, Northwestern, Central-Western, Pacific Coast and the Pacific Northwest. Those estimating a decrease were the Allegheny Great Lakes, Southeastern, Middle Western, Trans-Missouri-Kansas, Southwestern and New England.

Kearney & Trecker Build Additional Plant

The Kearney & Trecker Corporation, of Milwaukee, has let the contract for the construction of a new addition to its plant in Milwaukee. The addition will be 176 ft. long and 76 ft. wide and will afford almost 14,000 sq.ft. of manufacturing floor space.

In making the announcement of this increase in facilities, an official of the company takes the opportunity to state that the present plant has been operating at practically full capacity for over a year, and with the addition of a small night-force in the past several months. It has now been found necessary to increase manufacturing facilities. Considerable new machine tool equipment will be purchased for the new department.

Norton Co. Opens New Offices and Stockrooms

The Norton Co. of Worcester, Mass., has opened a new storehouse at 5805 Lincoln Ave., which will house the district offices and storerooms formerly located at 233 West Congress St. in Worcester. The new building, a three-story brick structure, is said to be the largest district storehouse for grinding wheels in the world.

More than half of the 50,000 sq.ft. of floor space in the building has been designed to store grinding wheels and other abrasive products. The basement of the building is given over almost entirely to stockrooms. The first floor will contain stockrooms, a truing room where wheels are aligned, the shipping department and a demonstration room for grinding machines. On the second floor most of the space is designed for storage purposes, though the receiving and packing rooms are located there. On the third floor are the offices, salesrooms and additional storage space.

Adjoining the building is a freight dock containing garages and the receiving dock.

Power Transmission Plans Annual Meeting Program

Discussion of the proposed "Staniar Power Transmission Association Handbook," which is to be published late next year, will be the principal topic presented at the annual meeting of the Power Transmission Association, to be held in the Hotel Commodore, New York, on Dec. 7. This discussion will be divided into four phases—approval of sections; assignment of sections for preparation; appointment and organization of sub-committee for editorial review; and adoption of procedure for final approval.

Another feature of the meeting will be a general organization of the activities of the Board of Advisory Engineers. It is expected that suggestions will be made to add such members to this board as would tend to make it thoroughly representative of designing and operating engineers in various industries. The board as already constituted will make certain recommendations intended to make its work more definite as to plan and procedure.

At noon the members will lunch jointly with members of the American Society of Mechanical Engineers. President Fisher, of the power association, will preside. W. L. Batt, president of SKF Industries, and R. T. Kent, chairman of the A.S.M.E. committee on professional divisions, will discuss the possibilities of joint activities of the two organizations. At this meeting William Staniar, belting and transmission engineer, the E. I. DuPont de Nemours Co., will deliver an address—"Mechanical Power Transmission Economies."

Following the luncheon the association will resume its session to receive reports from its committees on surveys and on merchandising. Manufacturers of power transmission machinery, appurtenances, accessories and supplies are invited to attend this session.

New Canadian Railroad Repair Shops

Construction work has been started on the locomotive and tender repair shops of the Canadian National Ry., at Point St. Charles, Montreal. The present shops are in full operation, the new construction work being so arranged as not to interfere. The new plant will be equipped with the most modern machine tools and with ten electric, overhead traveling cranes of various capacities.

National Association of Manufacturers Finds Business Conditions Good

Production has been maintained since last year

THE topics of paramount importance at the thirty-second annual convention of the National Association of Manufacturers, held in Chattanooga, Tenn., last week, were industrial preparedness, American economic and diplomatic frontiers of the future, wages, hours and production, industrial health, women in industry, and Government encroachment on business.

The annual survey of the nation's trade, which is an analysis of answers received from manufacturers in every line of activity, revealed that while current trade was in the "excellent to good to fair" category, the percentage of excellent business reported was slightly lower than in the fall of 1926. While the outlook for winter trade was reported generally optimistic, the percentage of adverse opinion as to prospects was higher than in 1926.

A diminution of the remarkable business tempo maintained through last year was also indicated by the reports on business conditions at present as compared with last fall, fewer reporting an increase in business this fall as compared with the reports last year.

The survey indicated that production has been maintained in practically unchanged volume since last fall, with a very slight decrease in sales quantities and a much higher drop in sales values. Industrial peace prevails almost without exception.

Bernard J. Mullaney, vice-president of the People's Gas, Light and Coke Co., of Chicago, declared that the public utilities of the United States would not oppose a legitimate, unbiased, nonpolitical investigation of industry by experts.

Mr. Mullaney held that putting the Government into business could lead only to communism and that running a business was not a proper governmental function in the United States.

He asserted that prosperity here was not due merely to the existence of great natural resources but to the conversion of such resources to usefulness, a natural function of business.

Colonel Hanford MacNider, Assistant Secretary of War, warned the meeting today that unless the manufacturers came to the rescue of the War Department speedily, the Army would be helpless for between six and nine months, waiting for ammunition, in the event of another war.

"Ten years is the life of our ammunition and the ten years is up now," he said. "We have no munitions to bridge the gap between the last hour of our supply and the day when industry can get under way in quantity production. Do you want your sons called to the colors with any such situation confronting them?"

The Open Shop Committee's report stated that the strength of the open shop had been revealed during the past year by the fact that the closed shop forces had made no gains in that time.

John E. Edgerton of Lebanon, Tenn., was re-elected president of the association, and Henry Abbott of New York was re-elected treasurer. Vice-presidents elected were: Otto H. Fischer, of Oakland, Cal.; Henry Trumbull, of Plainville, Conn.; F. Edson White, of Chicago; George A. Ball, of Muncie, Ind.; E. E. Strauss, of Louisville, Ky.; Clifford S. Anderson, of Worcester, Mass.; John Trix of Detroit; H. I. Finch, of St. Louis; Frank R. Valentine, of Woodbridge, N. J.; C. A. Braman, of New York; Charles B. King, of Marion, Ind.; William J. Wall, of Philadelphia; George H. Wilson, of Providence, R. I.; I. B. Merriam, of Chattanooga, and E. J. Harvey, of Racine, Wis.

Directors-at-large were elected as follows: William H. Barr, of Buffalo, N. Y.; Mayes H. Clemens, of Erie, Pa.; E. B. Leigh, of Chicago; George L. Markland, Jr., of Philadelphia; A. H. Mulliken, of Chicago, and A. T. Waterfall, of Detroit.

The following were appointed directors-at-large: Henry W. Cook, of Syracuse, N. Y.; Phillip O. Gier, of Cincinnati; E. M. Herr, of New York; Sam Tate, of Tate, Ga.; C. S. Walker, of Des Moines, and C. E. Whitney, of Hartford, Conn.

Lewis Benton of New York was named assistant to the president; George S. Boudinot of New York, secretary, and James A. Emery of Washington, D. C., general counsel.

The Problem of Industry

Before adjournment Michael J. Hickey, executive secretary of the National Industrial Council, conducted a symposium on "What Is the Most Important Problem Before Industry Today, and Why?"

The replies revealed an interesting variety. Some held that tax reduction was the most important problem facing industry, others thought that "the misleading talk of prosperity" was the answer. The replies varied from economy in production to the discontinuance of allegedly unfair regulatory laws now in force.

Mark A. Daly, secretary of the Associated Industries of New York State, said that one of the dangers facing industry today was the possibility of misleading the public with statements of a prosperity "which, so far as competitive business is concerned, is largely fictitious."

Tax reduction and the more economical expenditure of tax proceeds by State and Federal Governments were the suggestions of Mary Andrews Miller, secretary of the Manufacturers' and Employers' Association of South Dakota, and of E. L. Olney, manager of the Associated Industries of Vermont.

"Economy in industrial production," was the answer of J. G. Richards of the West Virginia Manufacturers' Association.

"Produce goods with the least possible cost and deliver them quick and cheap," he said.

Readjustment of freight rates was the problem regarded as most pressing by John L. Lovett, general manager of the Michigan Manufacturers' Association.

S.A.E. Transportation Meeting in Chicago

The transportation meeting of the Society of Automotive Engineers was held in the Hotel Sherman, Chicago, Oct. 25, 26 and 27. The technical sessions were divided into five groups—maintenance, operation and maintenance, freight handling, motor trucks, and rail car and motorcoach. The papers presented, and the general discussions, covered these subjects in a very thorough manner.

The paper "Shop Equipment and Tools," by Martin E. Goldman, of the Automotive Equipment Association was particularly interesting to production engineers. Mr. Goldman spoke at some length on the value of labor and time saving tools in the automobile repair shop.

"We must recognize the fundamental that the one basic commodity of trade is time. Consciously or unconsciously, time is always the element of barter. Time in the transportation business is necessarily the all-important element," he said.

"Then there is repair equipment. I have heard many bus and maintenance men argue that it was unnesessary for them to have certain pieces of equipment because they could send a particular job to an outside shop and have it economically taken care of. Economical for the actual job, yes; but I have found these same companies having a bus or truck idle for a full twenty-four hours, when, had they had the equipment in their own establishment, the job could have been done during the night, and the vehicle actually not have been out of the traffic line at all.

"I am not going to attempt to talk about any one piece of equipment or about any specific job, because there are men in a position to demonstrate and explain the mechanical operation of shop equipment and tools, and who can discuss the specific advantage and application of their tools to your particular business," added Mr. Goldman, "but shop equipment is shop efficiency, shop power, shop labor, shop time—which you buy and which pays tremendous dividends by reduction of idle time losses."

Board of Directors Elected for Copper and Brass Association

At the seventh annual meeting of the Copper and Brass Research Association, held on Oct. 20 in New York, the following were elected members of the board of directors, the first nine comprising the executive committee: R. L. Agassiz, chairman, Calumet & Hecla Consolidated Copper Co.; Walter Douglas, president, Phelps Dodge Corporation; C. F. Kelley, president, Anaconda Copper Mining Co.; Stephen Birch, president, Kennecott Copper Corporation; Charles Hayden, vice-president, Nevada Consolidated Copper Co.; John A. Coe, president, the American Brass Co.

F. S. Chase, president, Chase Brass and Copper Co., Inc.; Edward H. Binns, president, C. G. Hussey & Co.; Barton Haselton, president and general manager, Rome Brass and Copper Co.; J. W. Allen, treasurer, Greene Cananea Copper Co.; Charles F. Ayer, president, Magma Copper Co.; Francis J. Bassett, sales manager, Taunton-New Bedford Copper Co.; Julian B. Beaty, vice-president, Nichols Copper Co.; H. C. Bellinger, vice-president, Chile Exploration Co.; J. C. Clendenin, director, Braden Copper Co.

Carl F. Dietz, president, Bridgeport Brass Co.; B. Goldsmith, president, the National Brass and Copper Co.; E. O. Goss, president, Scovill Manufacturing Co.; C. V. Jenkins, treasurer, Utah Copper Co.; William Loeb, vice-president, American Smelting and Refining Co.; H. B. Paull, auditor, Calumet & Arizona Mining Co.; Dr. R. M. Raymond, director, United Verde Extension Mining Co.; Sam A. Lewisohn, vice-president and treasurer, Miami Copper Co.; C. M. Loeb, president, American Metal Co., Ltd.; Charles W. Clark, president, United Verde Copper Co.

William A. Willis, who has managed the association since its formation, was re-elected to that position. H. H. R. Spofford was re-elected secretary.

Recommend Changes in Tariff Act

Important changes in the administrative sections of the Tariff Act were recommended in behalf of the Treasury Department by E. W. Camp, commissioner of customs, before a subcommittee of the ways and means committee to consider customs administration and personnel during hearings in Washington on Oct. 24 and 25. The subcommittee, headed by Representative Bacharach of New Jersey, will conduct hearings on personnel at New York on Nov. 8, 9 and 10; and at Boston on Nov. 11. Later other ports may be visited.

In connection with the suggested changes in the administrative sections of the tariff, the National Association of Manufacturers, the Synthetic Organic Chemical Manufacturers' Association, and the National Council of American Importers and Traders were given permission to file briefs after having studied the proposals.

Chairman Bacharach, of the subcommittee, has expressed opposition to any amendments to the tariff act, believing that the authority of the subcommittee extends only to consideration of changes in matters which are subject to regulation as distinct from those which are matters of law.

Outstanding among the recommendations of Commissioner Camp was an amendment to the tariff act to change the basis of valuations for purposes of assessing duties on imports by striking out the alternative of using costs of production if neither foreign market value nor United States value can be ascertained, and enlarging the definition of United States value to take care of all cases where no foreign market value exists. This would be a concession to foreign public opinion which has resented efforts in the isolated instances where they have been made to ascertain costs of production of merchandise exported to this country.

In connection with the provision requiring foreign merchandise to be marked with the country of origin in all cases where this can be done without actual injury to the goods, the Commissioner suggested an amendment which would give the secretary greater discretionary power to determine what shall or shall not be marked. The courts have construed this section so literally that it has absurdities, the subcommittee was told.

Sixth Power Show in December

The growth of the anual Exposition of Power and Mechanical Engineering is an accurate measure of the advances in the development of mechanical power generating and using machinery. The sixth exposition is to be held at the Grand Central Palace, in New York, during the week commencing Dec. 5, paralleling the annual meetings of the American Society of Mechancial Engineers and the American Society of Refrigerating Engineers. Four floors of the Palace will be occupied by exhibitions of the latest mechanical devices. Over 500 exhibitors are participating and their exhibits will cover a wide range. Heat and power generation will occupy a large section with displays of boilers, stokers, furnaces, superheaters, valves and all the other accessory devices that are essential to the economical generation of steam. There will also be exhibitions of heating and ventilating equipment, refrigeration machinery, power transmission devices, machine tools, woodworking machines and a comprehensive section of instruments for measuring and recording time, pressure, volume, gas and air flow, temperature and, in fact, all of the variables that the engineer in industry must control.

A.S.M.E. Will Issue Engineering Index on Weekly Basis

Everything has been completed looking to a comprehensive scheme for indexing the engineering literature of the world to be initiated the first of the year, with the new weekly engineering index service of The American Society of Mechanical Engineers.

This task is so extensive as to include the preparation of index items for the 1,500 technical publications of the world appearing in seventeen languages in thirty-seven countries which are received in the Engineering Societies Library. The index items will be printed on cards and mailed weekly to the subscribers to the new service. This project was authorized by the A.S.M.E. Council at its St. Louis meeting on Oct. 8, as an important extension of the Engineering Index in its service to research and the development of industry.

The A.S.M.E. has published the Engineering Index since 1919 when it was taken over from the *Engineering Magazine*. During the eight years this book has been published by the society, its volume of material has increased from approximately 8,000 items annually to 16,000. These were first published monthly in *Mechanical Engineering* and at the end of the year collated in an annual volume. In the limited scope of a book of this kind it is possible to give only an incomplete service, while the modern needs of industry demand complete information about published technical material throughout the world.

This service is made possible by the splendid co-operation of the Library Board of the United Engineering Society Library and, in addition, the augmented technical staff of the society.

The new service will be under the general supervision of the Committee on Publications of the society, of which Ralph E. Flanders is chairman; and the Finance Committee, under the chairmanship of H. V. Coes. Professor Carlos deZafra, of New York University, will occupy the post of director of the Engineering Index.

Where Will the S.A.E. Meet in 1928?

The council of the Society of Automotive Engineers has instructed the meeting's committee to submit to the membership the selection of the place for the 1928 summer meeting which will be held some time in June. Four propositions are offered the members—an ocean cruise to Nassau; the Chateau Frontenac, Quebec, Canada; the boardwalk at Atlantic City, N. J.; or Spring Lake, N. J. A bulletin has been issued by the meeting's committee, of which L. C. Hill is chairman, outlining the attractions and advantages of each of these places and requesting the members to voice their selection on a card enclosed for the purpose.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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MATTER has three dimensions that can be visualized and measured. They are length, breadth, and thickness. But mathematicians assert that there is still another dimension whose existence can be proved although a mental concept of it is impossible. It is called the "Fourth Dimension" and belongs to the category of unthinkables that includes infinity, perfection, zero, and the minus sign, none of which are mentally comprehensible, although they connote abstractions that cannot be disputed.

These observations are suggested by the present financial condition of the United States. Huge loans to American and foreign borrowers are reported almost daily. In the aggregate they run into billions, but for each loan there is a corresponding deposit, and as no gold seems to be leaving the country, bank reserves as well as reserve ratios remain high and the supply of lendable capital appears to be inexhaustible. Hence it has been suggested that bank credit has a Fourth Dimension whose limitations are as yet beyond human ken.

At all events we are in a condition for which there is no exact precedent in financial history. Whether we call it inflation or something else, it is primarily due to the provisions of the Federal Reserve Act under which bank notes that pass as cash can be issued against commercial paper or merchandise. The ability to promptly liquefy property heretofore inconvertible has worked a profound change in our financial status, and a perception of this change is chiefly responsible for the long sustained rise in the securities market that now seems to be temporarily arrested.

But its interruption is not due to any scarcity of capital. The supply of money awaiting investment seems to be as large as ever and the decline in the value of stocks is attributable to the fear that we are entering upon a business recession that will reduce corporate earnings rather than to any expectation of higher interest rates.

This being the case, the important question is "will we see a further contraction in trade during the next six or eight months?" This is an exceedingly difficult question to answer.

Car loadings and railroad earnings, which are about the only available data, indicate that the volume of trade passing is about 5 per cent under the high record of 1926. This reduction has been reflected on the Stock Exchange, where many of the representative shares are substantially below the year's top.

WHAT'S DOING IN INDUSTRY

FROM a study of market reports from the important industrial centers of the country, it is apparent that October brought a desirable change for the better in the machinery and machine tool trade. Manufacturers of some lines are busier than others, but there seems to be a general revival of production activities. Dealers are somewhat contrary in their opinions, but there is a certain undertone of confidence in most reports.

CINCINNATI admits an increase in demand from large industrialists. A slow recovery with a generally better sales trend comes from Indianapolis. Detroit reports more substantial orders and better inquiry.

CANADA is looking for a good seasonal demand for machinery as the steel industry and the railroads expand their equipment policies. The South is progressing under the stimulus of good crop prices and expansion of industrial activity is riding on the wave of general business prosperity. In New England the builders of special machinery are the only prosperous ones in our line. Recent buying by railroads has bolstered up the present volume in New York.

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The stock market and business may be said to be on a parity insofar as present conditions are concerned, and from now on they ought to move in unison. If trade improves, stocks should go up, and vice versa. There is no prospect of a money scarcity, and the large amount that brokers are borrowing will have no terrors while the reserve ratio remains high.

In this situation the psychology of the business community is an important factor. Speculation is contracting. As the political uncertainties of 1928 multiply, it is gradually withdrawing from the stock market and the trade in grain is chiefly confined to the liquidation of earlier ventures. In sugar, coffee, and rubber, government control, present and prospective, has killed speculative initiative, and even cotton has lost a portion of the advance that followed the issuance of a very bullish ginning report and a still more bullish interpretation of it by the Secretary of Agriculture.

The trade in cotton goods is naturally restrained by the fluctuations in the raw material. The steel industry is still in the doldrums with a price tendency that favors buyers, and the copper producers are trying to form an "Institute" through which they can co-operate without conspiring to control prices and production. Woolen manufacturers are also planning something of the same kind and it is quite possible that all our larger industries will be stabilized or "institutionalized" in the not distant future.

Waiting is the word that best describes the attitude of business in America at present. Ninety per cent of the nation's trade is in necessaries or essential luxuries that are always passing into consumption. It is the remaining 10 per cent that makes the difference between prosperity and depression. Just at present the purchasers of this marginal 10 per cent seem inclined to procrastinate in buying and comparative quietude is the result. The probability is that it will continue until the public will become convinced that there is no warrant for the wide-spread fear of a "presidential year" that is felt by some.

Overseas, the political unrest is about normal. Prince Carol is trying to wrest the bauble called the Rumanian crown away from his baby son. Civil war seems to have been resumed in China, and Trotzky is planning something like a revolt against the Soviet powers that be.

But none of these things seem to mean much to "blessed America," and the President's proclamation aptly describes the nation's satisfaction in the prosperity that it enjoys and confidently expects to continue.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

INDIANAPOLIS

A slow expansion continues to feature the local machinery and machine tool market. The demand is somewhat spotted, but during the past month some of the spots are gradually disappearing and the general tone of the demand is better. A slight increase is seen in demand from the farm implement factories, which gradually are getting back into production in preparation for early spring demand.

One disappointing feature of the business is the slow demand from the steel trade. Just what the future this winter will be is a subject of much discussion among distributors here, for the large factories in the Calumet district and in the central Indiana district are not producing as they did this time last year. Another disappointing factor in the business is the demand from automobile factories.

With the reopening of the coal mines following a long suspension, there has been quite a call for supplies, most of which consists of small tools to be used in the mine machine shops, though inquiries are being received for large items of mine equipment. A few inquiries are being received from railroad sources, but the demand itself is spotted. Some orders are being received for special wood-working equipment.

NEW YORK

A few good orders from steel fabricators, pump manufacturers, electrical goods manufacturers and railroads brought the October volume of sales of machinery and tools to a fairly satisfactory level. Inquiries are in good volume, but they are mostly for single tools of a special nature.

The stir in railroad buying is a hopeful sign. The Central Vermont, the New York Central, the Cincinnati Street Ry., the C. C. C. & St. Louis, and the Central of Georgia were buyers of machinery in the past week. General industrial users placed orders for a great variety of equipment including braking machines, lathes, shapers, bench drills and lathes, profiling machines and grinders.

SOUTHERN DISTRICT

The latter part of October found the machinery and machine tool market better in the South. Sales are gaining steadily and the outlook gives every promise that business will continue active through the rest of the fall and into the early winter months. Dealers give as the reasons for their optimism the fact that cotton and other crop prices in the South this year are much higher than usual, and that this has had a tendency to ease the financial situation in this district, with the result that buying is being more freely done than in the past four or five years at this season.

Demand for woodworking machinery leads the field, especially in the Carolina, Georgia and East Tennessee territory where furniture factories are investing in machinery for plant expansion. Sales to textile plants continue fairly active and are still somewhat better than last year.

Sales of garage equipment have eased off a little, but are still considerably better than at this time last season. Smaller machine shops are not buying as heavily as had been expected. Both the garages and smaller machine shops are placing a good many of their orders for rebuilt or used machinery. Railroads are still placing a few good orders for heavier equipment, and with two or three important shop building projects announced since the middle of October this business is expected to show improvement in the near future.

DETROIT

Improvement continues in the machinery and machine tool market in Detroit and judging from immediate indications, the district is entering a somewhat better period than it has enjoyed for the past few months. While there is no flood of prosperity, there is a very definite upward trend. A great many inquiries have been received and many good orders are coming in.

This may be another flurry, but there are evidences that this is not the case. It is generally conceded that the entire automotive industry has been marking time. And inasmuch as 95 per cent or more of all the machine tool and machinery business here comes from the automobile and associated industries, the machinery business has been extremely dull. There is every probability that the next twelve months will recompense machinery dealers for the long period of waiting.

Many of the small tool and die shops are doing a big business. Some of them are working nights, but others are idle. Employment conditions have changed little within the past two weeks and apparently will not improve greatly until the Ford Motor Co. begins production.

NEW ENGLAND

Business in machinery and machine tools throughout the New England territory is spotty. A few manufacturers of automatic machinery, and of special purpose tools, are busy, and report that their 1927 business will exceed that of 1926. But on the whole, the industry is stagnant, due to a more or less general industrial depression throughout Connecticut and Massachusetts.

The exodus of textile, hardware and automobile accessory manufacturers to the South and Mid-West has had a grave effect on New England's industrial life. It is the general opinion among many who have studied the situation that the lack of foresight on the part of management, and conservatism on the part of bankers, is greatly responsible for this condition. New England industry is accused of not following the progress of the times, with the result that industry has sought the "promised land" in other parts of the country. It is said that had New England bankers offered financial aid to the textile industry when money was needed to change plants from the manufacture of cotton goods to the production of rayon and other silk fabrics, many of the plants could have survived the depression and the great textile centers of the East would have remained intact.

The typewriter plants are busy, Pratt & Whitney machine tool and aircraft activities have increased, and one or two special machinery plants are expanding. Hardware and electrical appliance and fixture people are very slow.

CANADA

Everything points to a gradual improvement in the metal working industry in Canada. Call for material now on contract is good, and while new buying is still in limited tonnages the outlook for future business is highly encouraging. The pulp and paper, construction and mining industries are placing a good volume of orders.

Signs of improvement in the iron and steel market continue to appear. After rolling 20,000 tons of rails in August and September, the Algoma Steel Corporation had orders on the books at the beginning of October totaling $4,173,000, including 50,000 tons of rails booked for winter rolling for Canadian roads.

The plants of the Dominion Bridge Co. are reported to be working at capacity. In addition to the ordinary run of construction work, the volume of which is showing a steady increase, there are several important developments which should keep the plants busy for some time to come.

Machine tool manufacturers will benefit from an extensive program for reconstruction of the Canadian National Ry. shops in Montreal, which has already commenced. The program includes a building for locomotive and tender repairs. A number of new machine tools will be required, and it is understood that tentative inquiries are now out.

CINCINNATI

The majority of machine tool manufacturers in the Cincinnati district report that there has been some increase in demand in the past week. Taking business as a whole, it has done better than hold its own. It is thought that a better market is developing in the East, especially among large users, such as railroads, locomotive makers and paper mills.

The greater part of the week's business consisted of orders for single tools and replacements. The principal buyers were general machinists and other small users, but there were also a few scattered orders from railroads and concerns in the automotive industry. Inquiries came in freely during the week. The great majority of these were in regard to single tools and replacements, but there were several of a fair size, one of which came from the oil fields of South America.

CHICAGO

The closing days of October find the market for machine tools still inactive. Inquiry among the trade discloses a somewhat discouraging condition. Buying during the month has not come up to the expectations which seemed to be warranted by an upward trend following the close of September. Industrial demand, as previously noted, consists of scattered orders to take care of replacements.

Practically the only call for new machinery in anything but small lots or single tools within the last several weeks was that originating in Milwaukee with the A. O. Smith Corporation, whose list is now about closed. The situation is brightened somewhat by the number of inquiries which continue to be received daily for both new and used equipment. Railroads are doing only such buying as is required by necessity.

Research Bureau Will Study Production

A survey of changing productivity is being undertaking by the National Bureau of Economic Research, of New York. The object of this survey is to ascertain as accurately as possible, for the various industries and processes, the typical number of units of product turned out for each hour of labor applied, and to compare the output at the present time with the output at earlier periods. For the time being, at least, the scope of this survey will be restricted to selected manufacturing industries and construction operations.

The results of other researches made by individuals and organizations will be synthesized as far as possible into a comprehensive treatment of changing productivity in the period under consideration. In addition, in those industries or for those periods of time which have not been otherwise adequately examined, the bureau plans to conduct original research by a study of the records of representative individual plants in the several industries.

It is hoped that the co-operation of a large number of manufacturers can be obtained in this survey. Factory executives who have records, over all or any part of the past thirty years, which they believe would enable a computation of the units of product per hour of labor, are requested to communicate with the bureau, indicating briefly the nature of the information they have.

The statistical analysis of the records in the individual plant will be made available to the executives of the establishment involved, for checking and for such private use as they may wish to make of it. No information received will be used in such a way as to enable identification of the facts concerning any establishment.

Official Nomenclature For Air Announced by MacCracken

Official nomenclature for the nation's air transport has been announced by Assistant Secretary William P. MacCracken, Jr. of the Aeronautics Branch of the Department of Commerce.

Aeronautic terms have been defined as follows:

AERONAUTICS—The science and art pertaining to the flight of aircraft.

AVIATION—The art of operating heavier-than-air craft.

AEROSTATION—The art of operating lighter-than-air craft.

AIRPORT—An airport is a locality, either water or land, adapted for the landing or taking-off of aircraft, and which provides facilities for shelter, supplies and repair of aircraft; or a place used regularly for the receiving or discharging of passengers or cargo by air.

AIRWAY—An air route between air traffic centers, with landing facilities at intervals, equipped with aids to air navigation and a communication system for transmission of information pertaining to the operation of aircraft. The term "airway" may apply to an air route for either land planes or seaplanes, or both.

Schwab Predicts Higher Prices for Steel in Future

Charles M. Schwab, chairman of the board of directors of the Bethlehem Steel Corporation, was elected president of the American Iron and Steel Institute at the semi-annual meeting of that body in New York on Oct. 28. Mr. Schwab, who is also president of the American Society of Mechanical Engineers, succeeds the late Judge Elbert H. Gary as head of the iron and steel association.

In his opening address the newly elected president sounded the keynote of the meeting when he declared that steel producers must co-operate to a greater extent in order to stabilize conditions and bring about a more favorable price level for steel products.

He declared that current prices for steel are far below a fair level and fail to provide a sufficient return on the tremendous investment in the industry.

"There are eight or nine billion dollars invested in the steel industry and on the average we are not getting as good a return as we would if our money had been put in gilt edged bonds," said Mr. Schwab. "A co-operative spirit is necessary in distribution and selling to get better prices and we should all live up to the motto of the late Judge Gary —'Live and let live.'"

That the necessity for co-operation is also felt by James A. Farrell, president of the U. S. Steel Corporation, the leading factor in the industry, was evidenced by his remarks in introducing Mr. Schwab as presiding officer.

Mr. Farrell said there has never been an era of more extensive co-operation in the steel industry without infringing any laws. He pledged the support of the Steel Corporation to the institute's new president.

James A. Campbell, president of the Youngstown Sheet and Tube Co., generally considered one of the most prominent men in the steel industry, said:

"There is nothing wrong with the country. There is nothing wrong with the steel industry except that prices are too low and none of us will be able to live long with such prices. We have put our costs down as low as we possibly can and must get more for our steel products. We cannot be expected to take our coal, ore and limestone out of the ground and put it into steel, selling this product at what our expenses are. The only solution is for better prices.

"The outlook in my opinion is satisfactory so far as business in concerned. We are somewhat disappointed at the delay in the fall demand developing, but this will come eventually."

General Carty Awarded John Fritz Medal

General John Joseph Carty, who has been awarded the John Fritz medal, is a vice-president of the American telephone & Telegraph Co. He began work with the Telegraph Dispatch Co., of Boston, in 1879. He invented a test system for the multiple switchboard form and installed the first metallic circuit multiple switchboard. In 1887, he was put in charge of the cable department of the Western Electric Co. and later of its switchboard department. He made many important improvements in design and installation.

In 1889, General Carty entered the service of the Metropolitan Telephone & Telegraph Co., which is now the New York Telephone Co., as electrician, and later became chief engineer. In 1907, he became chief engineer of the American Telephone & Telegraph Co.

General Carty has had many honors from institutions of higher learning, including Doctor of Engineering from Stevens Institute of Technology; Doctor of Science from the University of Chicago, Bowdoin, Tufts, New York University, Yale University and Princeton University; Doctor of Laws from McGill University. Among his other honors are the Longstreth Medal, and the Franklin Medal, the Edison Medal, of the American Institute of Electrical Engineers; Distinguished Service Medal of the United States; the rank of Officer of the Legion of Honor, France; the Orders of the Rising Sun and of Sacred Treasure of the Meiji, Japan.

General Carty is a past-president of the American Institute of Electrical Engineers and has been an officer or member in other scientific and engineering organizations, including New York Electrical Society, Telephone Pioneers of America, National Academy of Sciences, National Research Council, American Philosophical Society, Franklin Institute, Carnegie Institution of Washington and the Carnegie Corporation of New York.

Air Show in Berlin

An international aeronautics exhibition is being planned in Berlin. It will probably be held from March 23 to April 11, in 1928. The fair will comprise a joint showing of all the important types of commercial, sport and training planes. No mention is made regarding the participation of military or naval planes, either by manufacturers' exhibits, or in exhibition or competitive flights.

There will be booths at the exhibition for manufacturers of airplane motors and accessories of all kinds. Everything pertaining to aeronautics will be on exhibit, including raw materials, semi-manufactured goods and motor fuel. Aeronautic schools and publishers of aeronautical magazines will be represented.

Personals

L. KATTENBURG, president of Handelmy, R. S. Stokvis & Zonen, Rotterdam, Holland, arrived in the United States last week for a brief business visit.

JOSEPH W. MARSH, president of the Standard Underground Cable Co., has been elected chairman of the board of the newly organized General Cable Corporation.

A. E. R. TURNER has been appointed district manager in Montreal, Canada, for John Bertram & Sons, Ltd., of Dundas, Ontario. He was formerly district manager in Cleveland for the Niles Tool Works.

N. R. KETTERING, former chief construction engineer at the Delco-Remy plant at Anderson, Ind., who now is connected with General Motors export division at Stockholm, Sweden, recently underwent an operation at Stockholm for intestinal trouble.

W. M. DEVRIES, manager of the mechanical workshops of the Philips' Glowlampworks, Eindohoven, Holland, sailed for home on Oct. 24. He had been inspecting several large machine tool plants in this country.

JULES DIERCKX, for many years well known as the sales manager of the Keller Mechanical Engineering Co., of Brooklyn, N. Y., has retired from active service. His many friends will be glad to know that he expects to travel and otherwise enjoy the fruits of his years of labor in the mechanical field.

H. A. BROWN has been appointed vice-president and general manager of the General Motors of Canada, Ltd., to succeed Gordon Lefebvre, who has been transferred to the Oakland division of the General Motors at Pontiac, Mich. Mr. Brown has been comptroller of the industry at Oshawa, Ontario, for the past five years.

R. R. CANNINGTON and THOMAS D. DOYLE, officials of the Victoria Railway of Melbourne, Australia, were recent visitors at Purdue University, West Lafayette, Ind., and spent the day with Dean A. A. Potter inspecting the railway experimental work, laboratories and going over the instructional work given in railway engineering at the university.

Business Items

Fox Bros. & Co., Inc., formerly located at 126 Lafayette St., in New York, have removed to 33 Rector St.

The Federal Machinery Sales Co., of 17 S. Jefferson St., Chicago, has been appointed representative in that city for the Reed-Prentice Corporation, of Worcester, Mass.

The Van Dorn Electric Tool Co., of Cleveland, manufacturer of electric tools and distributor for the Van Norman Machine Tool Co., will hold its annual sales conference of branch managers on Nov. 4 at the Palmer House in Chicago.

The Delaware Brass and Aluminum Company, of Muncie, Ind., announces the change of the name of the company to the Beckett Bronze Company. There will be no change in the personnel, management or policy of the new company.

The automobile body manufacturing division of Rolls-Royce of America, Inc., East Springfield, Mass., has been transferred to the plant of Brewster & Co., Long Island City, N. Y., an affiliated concern. The deserted plant will be equipped as a service station and repair plant, where about 100 hands will be employed. This line of work from the Brewster company will be done at East Springfield. The object of the change is to group similar lines of work in one plant.

The Falk Corporation of Milwaukee, announces that arrangements have been made with William Kennedy & Sons, Ltd., Owen Sound, Ontario, whereby this company is to manufacture and sell Falk continuous tooth herringbone gears, herringbone speed reducers and flexible couplings in Canada. For sixty years, William Kennedy & Sons, Ltd., has been well known throughout Canada as founders and engineers.

The Wickwire Spencer Steel Co., Inc., voluntarily went into receivership under date of Oct. 22. Edward C. Bowers and Charles L. Feldman were appointed receivers by the court. Mr. Bowers was for the past two years president of the corporation. His appointment has insured the retention of the present organization which covers administrative, operation and selling. All the plants will be operated as heretofore without shut-down. There will be no rearrangement of the selling organization in any respect. The American Wire Fabrics Corporation, subsidiary, is not in the receivership and in no way affected by the proceedings.

Obituaries

LYMAN A. SISLEY, for twenty years editor of the *Engineering World*, died on Oct. 21 at his home in Chicago.

DAVID WILLIAMS, former publisher of the *Iron Age*, and prominent in the field of technical journalism, died at his summer home at Lake George, N. Y., on Oct. 28. He was 86 years old.

EDWARD J. DUNN, president of the Eclipse Machine Co., of Elmira, N. Y., died in that city on Oct. 23. Mr. Dunn was also a director of the American La France Fire Engine Co.

FRANK L. BROWN, vice-president of the Columbia Steel and Shafting Co., of Carnegie, Pa., died in Philadelphia on Oct. 14. He was a member of the Society of Automotive Engineers.

HARRY L. BROWN, secretary of the Ohio Brass Co., and formerly editor of the *Electric Railway Journal*, died at Toledo, Ohio, on Oct. 23. Mr. Brown was stricken suddenly with appendicitis while returning from a football game and died shortly after an emergency operation had been performed.

NORMAN SPEAR LAWRENCE, vice-president and director of sales for the Whiting Corporation, manufacturer of foundry equipment and railway supplies, died suddenly on Oct. 26. Mr. Lawrence was a mechanical engineer, graduated from Cornell University, and had been associated with the Whiting company since 1904. He was also president of the Swenson Evaporator Co., a subsidiary of the Whiting company.

Calendar of Local Meetings

American Society of Mechanical Engineers

Cleveland Section. Nov. 19. All-day session at Youngstown, Ohio. Subject: "Inauguration of the New Professional Division of the Iron and Steel Industry."

Metropolitan Section. Nov. 4. Hotel Astor, New York. Dinner and smoker at 7:00 p. m.

Philadelphia Section. Nov. 3. Elks' Hotel, Phila., Pa. at 8:00 p. m.

National Association of Cost Accountants

Baltimore Chapter. Nov. 15. Subject: "The Cost Accountant as an Aid to Management."

Boston Chapter. Nov. 17. Subject: "Economic Effects of Taking Business at or Below Normal Cost," by C. R. Stevenson, president of the National Association of Cost Accountants.

Buffalo Chapter. Nov. 17. Hotel Lafayette. Subject: "Operating and Financial Ratios."

Chicago Chapter. Nov. 17. Subject: "The Analysis and Distribution of Sales Promotional Costs," by James Howard Barrett, Kellogg Co., Battle Creek, Mich.

Cincinnati Chapter. Nov. 17. Subject: "Inventory Valuations," by R. Ruzicka, president, The Oakley Bank, Cincinnati.

Cleveland Chapter. Nov. 16. Plant Visitation, American Multigraph Co.

Detroit Chapter. Nov. 17. Subject: "Inventory—Its Planning, Taking and Compiling."

Erie Chapter. Nov. 21. Subject: "Standard Costs as Applied to Jobbing Plants."

Hartford Chapter. Nov. 15. Subject: "Local Cost Methods."

Hawaii Chapter. Nov. 28. Subject: "Sugar Plantation Accounting—Practical Methods vs. Theory," by Arthur Grounds.

Indianapolis Chapter. Nov. 16. Subject: "Purchasing, Receiving and Stock Control," by Carl Sheaver, treasurer, Marmon Motor Car Co.

Kansas City Chapter. Nov. 28. Subject: "Various Phases in Factory Insurance."

Los Angeles Chapter. Nov. 22. Subject: "Use of Costs by Club Managers," by Karl Lott.

Milwaukee Chapter. Nov. 10. Subject: "Typing up Costs With the General Books."

Philadelphia Chapter. Nov. 18. Subject: "Pennsylvania State Taxes," by Hon. Franklin Spencer Edmonds.

Pittsburgh Chapter. Nov. 16. Subject: "Future Developments of Cost Accounting—A Forecast," by Mervyn B. Walsh, president, Michigan Society of Certified Public Accountants.

Providence Chapter. Nov. 14. Subject: "Elements that Constitute Effective Cost Control," by L. M. Keefe.

Rochester Chapter. Nov. 16. Subject: "How I Close the Books and Furnish Statements by the Tenth of the Month," by W. L. Lewis, Bethlehem Steel Co.

St. Louis Chapter. Nov. 15. Subject: "Budgets and Budgetary Control," by Franzy Eakin.

Scranton Chapter. Nov. 15. Subject: "Cost Accounting in the Coal Industry," by Geo. E. Stevenson.

Springfield Chapter. Nov. 9. Subject: "Planning, Taking and Compiling the Physical Inventory."

Syracuse Chapter. Nov. 15. Subject: "High Spots in the History and Development of Cost Accounting," by John A. Powelson.

Twin Cities Chapter. Nov. 8. Subject: "Burden Application—Actual Cost Method," by J. A. Boulay.

Utica Chapter. Nov. 21. Subject: "Traffic Problems," by F. B. Ruder, Remington Typewriter Co.

Worcester Chapter. Nov. 10. Hotel Bancroft. Subject: "Inventory Control," by D. P. Crimmins, Crompton & Knowles Loom Works.

Forthcoming Meetings

Automotive Equipment Association. Annual exposition, at the Colliseum, Chicago, Nov. 7 to 12.

National Founders Association. Convention, Hotel Astor, New York, N. Y., Nov. 16-17. J. M. Taylor, secretary, 22 S. La Salle St., Chicago.

American Society of Mechanical Engineers. Annual meeting, Engineering Societies Bldg., New York City, Dec. 5 to 8. C. E. Davies, assistant secretary in charge of meetings, 29 West 39th St., New York City.

National Exposition of Power and Mechanical Engineering. Sixth annual event in the Grand Central Palace, New York, Dec. 5 to 10. Charles F. Roth, manager, Grand Central Palace, New York City.

Power Transmission Association. Annual meeting, Dec. 7, Hotel Commodore, New York City. W. S. Hays, secretary, Drexel Bldg., Philadelphia.

American Association for the Advancement of Science. Second Nashville meeting, Nashville, Tenn., Dec. 26-31, general headquarters Andrew Jackson Hotel. General chairman, W. S. Leathers, M.D., professor of preventative medicine and public health, Vanderbilt Medical School, Nashville, Tennessee.

The Weekly Price Guide

Rise and Fall of the Market

FABRICATED steel structurals and agricultural machinery material are moving in fairly large volume; buying appears slower, however, in the other items on the iron and steel list. Prices moved upward in scrap copper, lead, and brass among New York dealers during the week. Sharp declines, compared with Oct. 21 levels, occurred in cold-rolled strips, steel sheets, wire nails, aluminum ingots, linseed and machine oils, and foundry coke. Steel shapes and plates, base, Pittsburgh, are now $1.75 per 100 lb.; with bars, $1.75@$1.85, f.o.b. mill. Maximum on shapes and plates has been running 5c. per 100 lb. above present quotations.

(All prices as of Oct. 28)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	17.75
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00@5.25
Cincinnati	4.30
New York	4.75@5.25
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.15	3.50	3.25	3.89
No. 12	2.15@2.20	3.55	3.30	3.94
No. 14	2.20@2.25	3.60	3.35	3.99
No. 16	2.30@2.35	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.70	3.75	3.55	4.00
No. 22	2.85	3.90	3.70	4.15
No. 24	2.90	3.95	3.75	4.20
No. 26	3.00	4.05	3.85	4.30
No. 28	3.25	4.20	4.00	4.45
Galvanized				
No. 10	3.05	4.10	3.95	4.25
Nos. 12 to 14	3.15	4.20	4.05	4.35
No. 16	3.25	4.30	4.15	4.45
No. 18	3.40	4.45	4.30	4.60
No. 20	3.55	4.60	4.45	4.75
No. 22	3.60	4.65	4.50	4.80
No. 24	3.75	4.80	4.65	4.95
No. 26	4.00	5.05	4.90	5.20
No. 28	4.25	5.30	5.15	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded.	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded.	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches — ½	¾	¾	⅞	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per lb., base:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	5.70	6.10
Floor plates	5.25	5.30	5.00
Cold drawn, round and hex.†	4.00	3.65	3.60
Cold drawn, flats and squares	4.50	4.15	4.10
Structural shapes (base)	3.34	3.00	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.65	3.65
Tank plates (base)	3.34	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, ⅜", 8.35c.; ¼, 7.85c.; ⅜" to ½", 7.35c. per lb. *Flat, ⅛"@¼-in. thick. †Shafting and screw stock.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots			
Copper, electrolytic, up to carlots, New York			14.50
Tin, pigs, 5-ton lots, New York			60.37½
Lead, pigs, up to carlots, E. St. Louis 6.00		New York	6.87½
Zinc, slabs, up to carlots, E. St. Louis 5.90		New York	6.87½

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	13.50	14.00	13.00
Copper sheets, base	22.00	22.00	22.00
Copper wire, base	18.75	18.75	15.25*
Copper bars, base	21.50	21.50	21.50
Copper tubing, base	24.00	24.00	24.00
Brass sheets, high, base	18.25	18.25	18.25
Brass tubing, high, base	23.12½	23.12½	23.12½
Brass rods, high, base	16.00	16.00	16.00
Brass wire, high, base	18.75	18.75	18.75

*Mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	25.00	26@27	26.02
Zinc sheets (casks)	11.00	11.55	10.11
Solder (½ and ½), (case lots)	36.25	37.00	38½@42½
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			78.00
Commercial genuine, intermediate grade			61.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			12.50
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 35.00	Electrolytic 37.00	Shot	36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper	11.37½@11.62½	10.75	10.00@10.50
Copper, heavy, and wire	10 87½@11.37½	10.75	9.75@10.25
Copper, light, and bottoms	9.75 @10.00	9.25	8.75@ 9.25
Heavy lead	5.00 @ 5.37½	5.25	4.50@ 5.00
Tea lead	4.00 @ 4.25	3.75	3.50@ 4.00
Brass, heavy, yellow	7.25 @ 7.50	7.00	6.75@ 7.25
Brass, heavy, red	9.00 @ 9.25	9.50	8.75@ 9.25
Brass, light	5.25 @ 5.75	5.50	5.75@ 6.25
No. 1 yellow rod turnings	7.25 @ 7.75	7.00	6.75@ 7.25
Zinc	3.75 @ 4.00	3.25	3.00@ 3.50

TIN PLATES—Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@ .17
Wiping cloths, washed white, per lb	.15½	36.00 per M	15
Sal soda, per lb	03¾	02	02¾
Roll sulphur, per lb	02⁷	03½	04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	78¾	.94	.79
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	.27	.35	.26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	35%	35%	35%
Heavy grade	30%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%*
Second grade	50–10%	60–5%	50–10%†

*Large quantities, 60%. †Large quanities, 60-10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb.	.16	.16	.1687½
Solder (½ and ½)	per lb.	.36¼	.38½	42½
Cotton waste, white	per lb.	.10@13½	.10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.10
Lard cutting oil	per gal.	.65	.65	.55
Machine oil	per gal.	.27	.27	.35
Belting, leather, medium	off list	35%	40–5%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5.13	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville, 2.75@3.00	
Coke, prompt foundry, per net ton		Connellsville, 3.75@4.50	
White lead, dry or in oil,	100 lb. kegs	New York,	13.75
Red lead, dry,	100 lb. kegs	New York,	13.75
Red lead, in oil,	100 lb. kegs	New York,	15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.	55%
Larger up to 1 x 30-in.	50%
1½ and 1¼ in. dia.	35%
Carriage bolts:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in, incl.	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb.	$3.50*
Rivets, button and cone head:	
Small, including ⅛-in. dia	50–10%
Large (base) per 100 lb. net	$5.00†

Note—Less than case or keg quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.

*$1.50 off list on broken keg lots. †$6.50 broken keg lots net.

Machine Requirements and Industrial Construction

Equipment Wanted

Calif., San Rafael—Bd. of Education, O. R. Hartzell, Secy.—woodworking machinery for proposed shops for high school.

Ill., Chicago—A. Finkl & Sons Co., A. Finkl, Pres., 1236 Cortland St.—35 ton electric crane for proposed machine shop.

Ill., Chicago—Rossbach & Son, 520 Sherman St.—welding machines and other equipment for proposed 1 story, 77 x 96 ft. factory. Estimated cost $20,000.

Mass., Allston (Boston P. O.) — R. Kredenser, 33 Wellington Hill St., Mattapan—miscellaneous tools and equipment for proposed 1 story, 75 x 135 and 30 x 40 ft. repair and service garage here. Estimated cost $40,000.

Mass., Arlington Heights (Boston P. O.) —W. Barry, 72 Park Ave.—lathe and electric drill.

Mass., Boston—Albany Milling Co., 11 Bristol St.—late model 2 spindle moulder, American 20 or 21.

Mass., Cambridge (Boston P. O.)—M. H. Gulesian, 85 Commonwealth Ave., Newton, miscellaneous tools and equipment for proposed 2 story garage and repair shop here.

Mass., Roxbury (Boston P. O.)—W. E. Collins, 555 Huntington Ave.—Stark bench lathe, No. 4½.

Mass., Stoneham (Boston P. O.) — M. Ohlsson, 47 Green St.—miscellaneous tools and equipment including forge and blower for proposed blacksmith shop.

Mich., Lansing—Oldsmobile Motor Co.—machinery and equipment including crane, etc., for proposed 1 story, 90 x 400 ft. factory.

N. Y., Auburn—Charles W. Tuttle—14 in. roughing mill stand for rolling mill.

O., Clyde—Red Stove & Heater Co., 119 Birdsey St., H. B. Reppetto, Mgr.—equipment including metal working machinery, etc., for proposed new factory.

O., St. Marys—St. Marys Wheel Co.—seventy-five woodworking machines.

O., Youngstown — Youngstown Sheet & Tube Co.—three cranes for boiler room.

Tex., Palestine — International Great Northern Ry. Co., Union Station, Houston, complete equipment for proposed round house. Estimated cost $125,000.

Que., Montreal—Shell Co. of Canada, 190 St. James St.—complete equipment for proposed service station.

Que., Montreal—R. A. Vinet, 50 Lapailleur St.—complete equipment for proposed repair and service garage.

Que., Pointe St. Charles—Canadian National Rys., Montreal, L. Lavoie, Gen. Purch. Agt.—ten overhead electric cranes, also machine tools for proposed new shops, here.

Opportunities for Future Business

Ala., Pratt City — Birmingham Pressed Steel Co. plans the construction of a toy factory. Estimated cost $60,000.

Calif., San Francisco—Crane Co., Second and Brannan Sts., awarded contract for the construction of annex to pipe shop. Estimated cost $40,500. Noted Oct. 6.

Ill., Chicago — Chicago-Nash Co., 2000 South Michigan Ave., awarded contract for the construction of a 200 x 316 and 160 x 376 ft. automobile plant. Noted Oct. 13.

Ill., Chicago—Globe Co., 818 West 36th St., manufacturers of packing house equipment, awarded contract for a 1 story, 55 x 144 ft. addition to factory.

Ill., Chicago — Hudson Metal Products Co., 120 North Green St., manufacturers of screw machine products, plans the construction of a 1 story, 70 x 125 ft. factory at St. Patrick and Arthington Sts. A. E. Strobel, 53 West Jackson St., Archt.

Ill., Chicago—M. A. Nelson, 1720 North California, Archt., is preparing plans for 40 x 112 and 23 x 40 ft. addition to machine shop, at 5441 West Lake St. Estimated cost $20,000. Owner's name withheld.

Ill., Chicago — Morkrum-Kleinschmidt Corp., 1410 Wrightwood Ave., manufacturers of automatic telegraph instruments, plans a 3 story addition to factory. H. A. Durr & Co. ,123 West Madison Ave., Engrs.

Ind., Hammond — S. G. Taylor Chain Co., 140 South Dearborn St., Chicago, Ill., awarded contract for a 2 story, 40 x 120 ft. addition to factory here.

Ind., South Bend—M. B. Skinner & Co., 562 Washington St., Chicago, Ill., awarded contract for a 1 story factory, here, for the manufacture of steam pipe leak clamps, valve and bibb resetting tools, gasket cutters, etc. Estimated cost $100,000.

Ind., South Bend—Whitcomb & Keller, awarded contract for the construction of a 1 story, 33 x 165 ft. machine shop and sales and service station at 317 South Lafayette St. Estimated cost $43,000.

Ind., Terra Haute—L. E. Waterman, awarded contract for the construction of a 1 story, 65 x 160 ft. garage and repair shop on Cherry St. Estimated cost $40,000.

Mass., Arlington (Boston P. O.)—H. L. Frost Co., 20 Mill St., is receiving bids for a 2 story, 60 x 70 ft. garage and repair shop. Estimated cost $40,000. G. E. Robinson, 80 Federal St., Boston, Archt.

Mass., Attleboro—L. G. Balfour Co., L. G. Balfour, Treas., County St., manufacturing jewelers, plans the construction of two additions to factory on North Main St. Architect not selected.

Mass., Beverly—United Shoe Machinery Co., Elliot St., awarded contract for a 4 story, 60 x 200 ft. addition to factory. Estimated cost $50,000.

Mass., Cambridge (Boston P. O.)—Dewey & Almy Chemical Co., Harvey St., will build a 1 story, 50 x 120 ft. machine shop. H. L. Kennedy, 80 Boylston St., Boston, Archt.

Mass., Cambridge (Boston P.O.)—Klauer Bros., 345 Franklin St., awarded contract for a 2 story repair and service garage. Estimated cost $50,000. Noted Oct. 20.

Mass., Fitchburg—Kenmore Realty Co., c/o B. Rockman, 41 Nobscott Rd., Newton, awarded contract for a 2 story repair and service garage at Broad and Putnam Sts. here. Estimated cost $50,000.

Mass., Malden (Boston P. O.)—Malden Investment Co., c/o R. K. Kaulback, 112 Pleasant St., awarded contract for a 1 story repair and service garage at Exchange and Abbott Sts. Estimated cost $40,000.

Mass., Waltham (Boston P. O.)—E. E. Smart, 809 Main St., will build a 1 story repair and service garage. Estimated cost $40,000. W. H. Haines, 32 Riverview Ave., Archt.

Mich., Detroit—Dept. of Street Railways, St. Jean & Shoemaker Ave., awarded contract for a 1 story car house and car service building at Grand River and Coolidge Hy. Estimated cost $100,000. Noted Mar. 10.

N. J., Hillside—The Rubberstone Corp., 1 Madison Ave., New York, N. Y., manufacturers of flooring, etc., awarded contract for a 1 story, 60 x 175 ft. factory. Estimated cost $40,000.

N. J., Jersey City—American Can Co., 120 Broadway, New York, N. Y., is having plans prepared for the construction of a garage, etc., at St. Pauls Ave. and Erie R.R. Total estimated cost $2,000,000. C. G. Preis, 120 Broadway, New York, N. Y., Archt. Noted Oct. 20.

N. J., Newark—L. A. Myers, Jr., Inc., 139 Ogden Ave., manufacturers of metal products, is having plans prepared for a 2 story, 78 x 90 ft. factory. Estimated cost $40,000. E. C. Epple, 9 Clinton St., Archt.

N. Y., New York—J. A. Wetmore, Supervising Archt., Washington, D. C., will receive bids until Nov. 21 for the construction of a garage at U. S. Quarantine Station, here.

N. Y., Syracuse—The White Motor Co. awarded contract for a 1 story sales and service station. Estimated cost $150,000. Noted Aug. 11.

O., Akron—Mogadore Insulator Co. will soon receive bids for a 1 story factory at Coxentry Blvd. Estimated cost $40,000.

O., Cleveland—Angell Nail & Chaplet Co., 2657 East 79th St., awarded contract for a 1 story, 90 x 340 ft. factory. Estimated cost $125,000. Noted Oct. 20.

O., Cleveland—New York Central R.R., 466 Lexington Ave., New York, N. Y., awarded contract for 1 story additions to engine house and fan room at East 152nd St., here Estimated cost $60,000. Noted Oct. 6.

O., Columbus — Walter B. Zimmerman Co., 552 East Broad St., awarded contract for a 1 story, 80 x 168 ft. garage and repair shop at North High St. Estimated cost $45,000.

O., Galion—The Galion Iron Works & Mfg. Co. awarded contract for a 1 story, 85 x 345 ft. factory. Esitmated cost $150,000. Noted Oct. 6.

O., Youngstown—National Refining Co., National Bldg., Cleveland, awarded contract for the construction of a garage and service station here. Estimated cost $100,000.

Okla., Oklahoma City — Sheffield Steel Corp., W. L. Allen, Pres., Kansas City, Mo., plans the construction of a branch plant here.

Pa., Chester—H. H. Ward, manufacturer of sheet material, will soon award contract for a 3 story, 59 x 140 ft. factory at Fourth and Eagle Sts. Ballinger Co., 12th and Chestnut Sts., Philadelphia, Archt.

Pa., McKeesport—City, c/o Mayor Lysle, will soon award contract for a 1 and 3 story, 60 x 90 and 80 x 106 ft. garage, etc. Estimated cost $150,000. H. J. Lohman, Archt.

R. I., Pawtucket — Superior Cabinet Works, Inc., R. L. Norstern, 93 Newell St., will have revised plans prepared for a 1 story, 70 x 250 ft. mill. Estimated cost $40,000. E. G. Bullard & Son, 908 Purchase St., New Bedford, Mass., Archts. Former bids rejected. Noted Sept. 22.

R. I., Providence—J. Conn, c/o T. J. H. Pierce, Inc., 30 Allens Ave., Archt., will soon award contract for the construction of a 3 story garage and repair shop at Chestnut and Broad Sts. Noted Oct. 27.

R. I., Providence—C. H. Page & Son, 200 South Main St., awarded contract for the construction of a 1 story, 50 x 100 ft. repair and service garage on Wells St. Estimated cost $40,000.

Tenn., Chattanooga — Broad Street Garage Co. awarded contract for a 4 story garage on Broad St. Estimated cost $150,000. Noted Sept. 22.

Texas — Alamo Iron Works, 130 Santa Clara St., San Antonio, plans the construction of a shop and warehouse at San Antonio, Brownsville, and Corpus Christi. Estimated cost $200,000, $150,000 and $200,000 respectively. Private plans.

Ont., Galt—B. F. Sturtevant Co., plans the construction of a 1 story, 60 x 150 ft. factory on First Ave. to increase the capacity. Estimated cost $50,000. Private plans.